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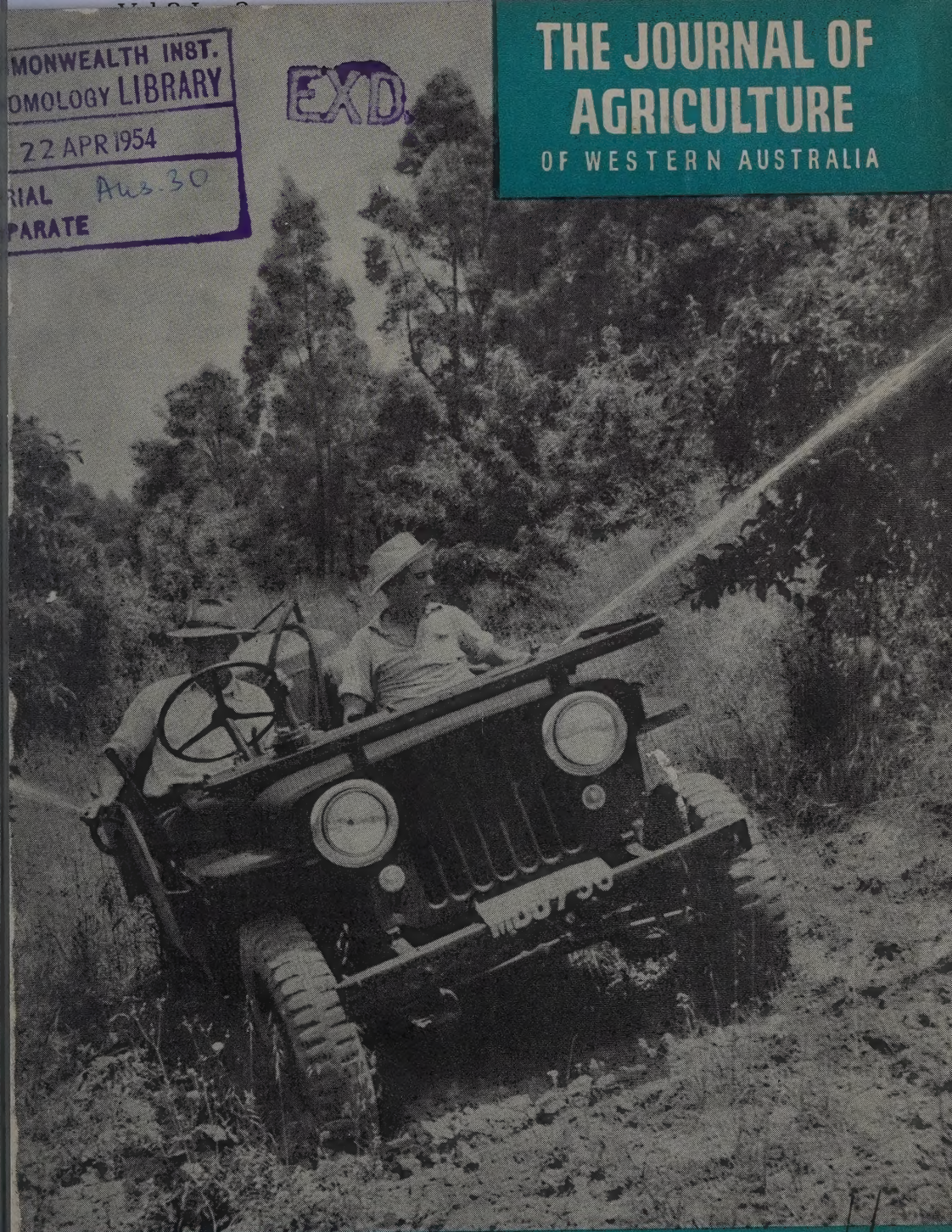

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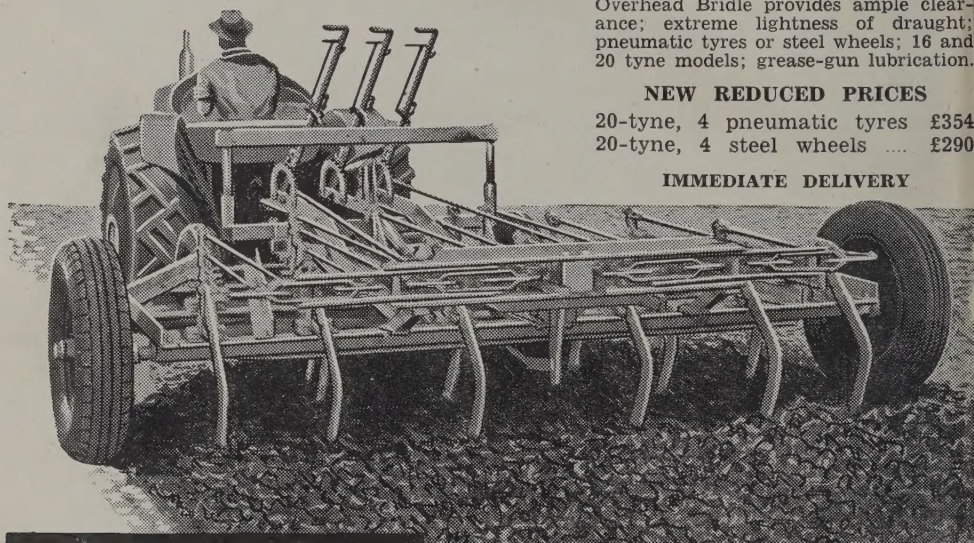

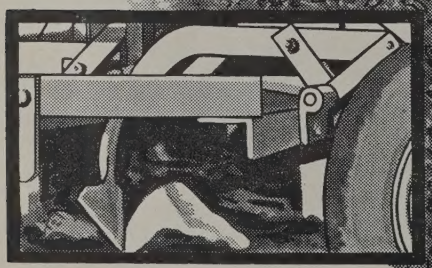

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WESTERN AUSTRALIA

VOL. 3 (Third Series) JANUARY - FEBRUARY, 1954 No. 1

Published every second month by the Department of Agriculture, St. George's Terrace, Perth

The subscription rate (which includes postage) is 10s. per annum. Single copies 2s. each

Edited by
J. A. MALLETT

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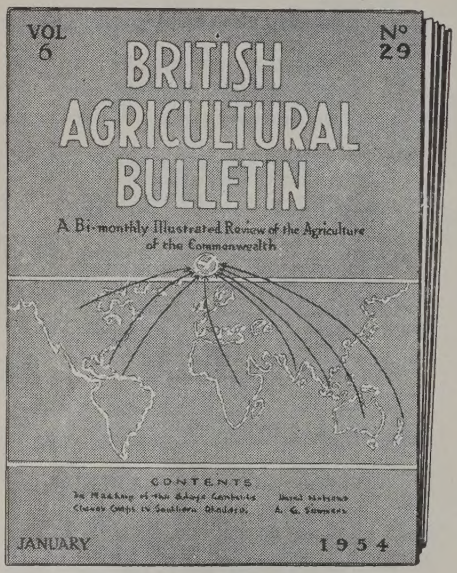

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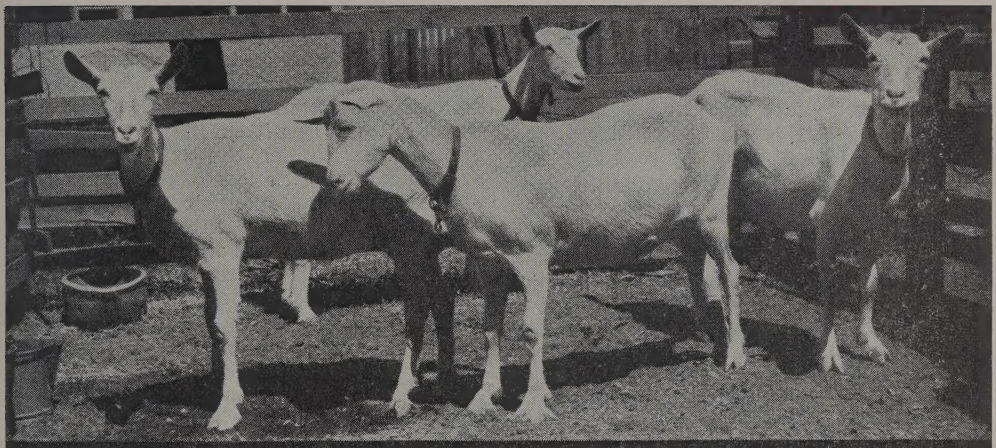
Published every Two Months by
BRITISH AGRICULTURAL BULLETIN,
65 Davies Street, London, England.



DISEASES of GOATS

By J. Shilkin B.V.Sc. Senior Veterinary Surgeon

MANY of the diseases of goats are common to sheep and cattle, and, as in these species, correct feeding, hygiene and general care and management will assist in the avoidance of serious ailments. In this article an attempt will be made to advise goat-owners on the diagnosis of the more common ailments, and suggestions as to treatment will be offered where possible. It should be appreciated however that where veterinary assistance is obtainable it is preferable to first-aid treatment. A qualified veterinarian has access to newer and more efficient methods of treatment than are available to the layman.

An outline of sound stock-husbandry measures for goat-keepers has already been given in a previous article in this Journal. The risk of losing valuable animals can be lessened by following the suggestions incorporated in that article; by the avoidance of over stocking; the destruction of harmful weeds; the removal of loose wire and other hazards, as well as by cautious grazing on green feed and discriminating use of concentrates.

MASTITIS.

While mastitis may not be the cause of many deaths among milking does, it frequently results in permanent losses in production due to the formation of fibrous tissue in the udder. As with cattle, mastitis may occur in two main forms—either acute or chronic—depending usually on the type of infection which is responsible.

Acute mastitis usually occurs soon after kidding but occasionally appears later in the lactation period, particularly where hygiene is poor. It is characterised by a hot, tense, painful swelling of one or both sides of the udder. The affected quarter or quarters are hard to milk, and the secretions may be watery or bloodstained.

Chronic mastitis may occur at any time during the lactation period and may also be the outcome of a previous acute attack. In some cases the milk may appear perfectly normal. Where it is abnormal it may vary from the presence of a few clots to a curdy, stringy, slimy or watery appearance. At times the teat canal may be found

blocked at each milking. Deep-seated ball-like lumps high up in the gland are not uncommon. These indurations, as they are called, are due to deposits of fibrous tissue which replace secreting tissue, and may permanently lower the milk production of an affected quarter.

Treatment.—The use of penicillin suspension put into tubes as prepared for the treatment of mastitis in cows is most satisfactory. The injection of one tube of at least 25,000 units into the empty quarter at 24 hour intervals for three days is likely to be successful in acute cases. Similar treatment is suggested in chronic cases but may not be so successful.

Where there is considerable pain and swelling in the acute form, hot fomentations and frequent stripping, combined with the use of a stimulating liniment such as eucalyptus liniment may help to alleviate the pain.

Eucalyptus liniment consists of eight parts of soft soap; two parts of eucalyptus oil; eight parts of water. It should be applied freely and the parts thoroughly massaged.

Does affected with mastitis should always be milked after the healthy animals as the disease may be transferred on the hands of the milker. The milk from the affected quarters should be directed into a tin containing antiseptic and then destroyed.

MILK FEVER.

This condition is most likely to occur in heavy milkers at their second, third or fourth kiddings. It is generally seen within two or three days after kidding but may occur just before, or up to several months after, kidding.

The actual cause of the disease is unknown but it is generally thought to be due to an upset of the parathyroid gland which in turn affects the level of calcium in the bloodstream so that there is a sudden deficiency of this mineral.

Symptoms.—The earliest signs of milk fever are loss of appetite and an unsteady gait but these are often overlooked and the animal is found to be recumbent and in a partial or complete coma. The doe may remain in this comatose state and eventually die without regaining consciousness if treatment is not applied.

Treatment.—Calcium borogluconate is the standard treatment for this condition. One ounce of calcium borogluconate should be dissolved in four ounces of boiling water which should then be cooled to blood heat. The solution can then be injected subcutaneously (under the skin) into three or four sites in the loose skin of the neck and behind the shoulder. As irritation and swelling of these injection sites may occur, an intravenous injection is preferable but this usually requires the services of a veterinary surgeon.

In most cases the animals regain their feet fairly quickly after treatment, but should not be milked for 24 hours and then only a small quantity of milk should be withdrawn, increasing the quantities over the next two or three days until normal milking is resumed.

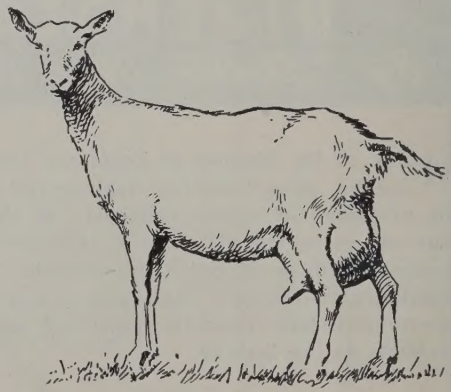


Fig. 1.—A healthy goat should be smart and alert in appearance

HOVEN OR BLOAT.

The cause of this condition is not fully understood. It usually occurs when goats are running on succulent green feed, especially lucerne or clover, but cases have also been seen on dry feed.

Symptoms.—Rumination is suspended, respiration becomes difficult and the expression of the animal is anxious. The left flank becomes markedly distended with gas. Death may occur from respiratory failure, caused by the pressure of the gas on the heart and lungs.

Treatment.—Pull the tongue as far forward as possible to induce the belching of gas, or pass a narrow rubber tube down the

gullet. Four ounces of raw linseed oil plus one teaspoonful of turpentine may be given.

Where the condition is severe, veterinary assistance should be obtained if possible.

LAMINITIS OR FOUNDER.

This is usually an acute systemic condition in which lameness is the most marked symptom. Laminitis may be caused by excessive feeding on wheat or wheat products, travelling on hard roads with badly-trimmed feet and by infection with bacteria.

Symptoms.—Acute lameness is always present. The animal refuses to walk and often progresses on the knees. The feet are hot and tender and there is usually loss of appetite.

Treatment.—Where possible, and where the animal will eat, green feed should replace concentrate feeding. A drench of one or two ounces of raw linseed oil may be given daily and hot bran poultices containing a little raw linseed oil should be applied to the feet and bandaged in place. As an alternative to the poulticing, allowing the animal to stand in a tin of hot water for about 20 minutes two or three times a day may be helpful.

However, treatment with one of the newer antihistamine drugs which are available to veterinary surgeons, may reduce the condition much more quickly.

IMPACTION AND CONSTIPATION.

These complaints are seen mostly in older animals which are overfed and under-exercised. Dry, hard, or fibrous feed and lack of green feed are commonly responsible for impaction and constipation.

Symptoms.—The animal ceases to chew its cud, loses its appetite and becomes lethargic and dull. There may be a tendency to bloating.

Treatment.—Give five to six ounces of raw linseed oil or paraffin oil plus an enema of about one quart of warm soapy water. When the animal will eat, supply young succulent green feed wherever possible.

RETAINED AFTERBIRTH.

Retention of portion of the afterbirth is not uncommon in does which have had a difficult kidding, especially where assistance has been given. After three or four days, the opening into the womb is closed tightly and any portions of afterbirth retained commence to putrefy, often resulting in an infection of the womb (Metritis).

Symptoms.—There is usually a chocolate-coloured, gelatinous discharge from the vagina which soils the tail and surrounding areas. Appetite becomes poor, milk yield drops and the doe loses condition.

Treatment.—Early treatment of this condition is important as blood poisoning (Septicaemia) may develop, and this is usually fatal. Veterinary attention is desirable in this condition but in the meantime, the vagina may be washed out with a 2 per cent. Dettol solution and the discharge kept off the tail and hindquarters.

Where veterinary assistance is not obtainable the subcutaneous injection of sodium sulphamezathine 33⅓ per cent. solution would be of value in overcoming any infection produced by the retention of the membranes. This is injected in a dose rate of 15 c.c. per 100 lb. body weight on the first day and 10 c.c. per 100 lb. body weight once daily for the next four or five days.

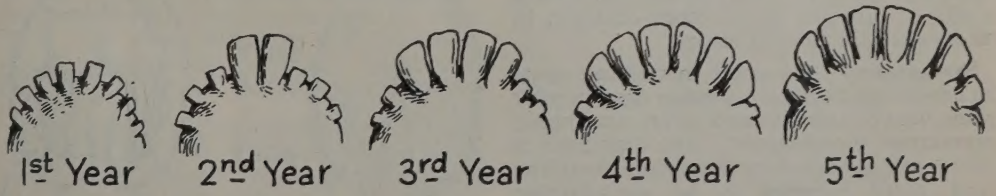


Fig. 2.—The dentition of the goat is similar to that of the sheep. In the second year, the two central permanent incisors appear with two more each succeeding year. Eight permanent teeth are seen in the fifth year when the animal is "full-mouthed"

SORE TEATS.

Chapped or cracked teats may occur when the teats are not dried after milking particularly in cold weather. Teats may be also torn by barbed wire, thorns, etc.

Treatment.—Small wounds may be treated by first dressing with an antiseptic solution such as Dettol, drying, and then binding the teat with adhesive plaster to draw the edges together. Instead of hand milking it is preferable to allow the kid to suck for a few days.

For large lacerated wounds where suturing may be necessary, treatment by a veterinarian is desirable.

For chapped and cracked teats the following ointment is useful:—

Lanolin 1oz.
Vaseline 1oz.
Salicylic Acid ½oz.

This should be applied twice daily after milking. A 2 per cent. acriflavine emulsion used in the same way is also useful.

ENTERO-TOXAEMIA.

This is an acute infectious disease which is common in sheep in W.A., but which may also affect goats.

It is caused by a specific germ called *Clostridium Welchii* type D, a normal inhabitant of the bowel which multiplies rapidly under favourable conditions and produces a powerful toxin. This toxin is then absorbed from the bowel producing a toxaemia which is usually fatal.

Anything which results in a slowing down of the bowel movements may result in favourable conditions for the multiplication of these bacteria and the resultant toxin production. Outbreaks of the disease are common during periods when plentiful supplies of lush feed enable the animals to eat their fill without taking adequate exercise. The disease may attack goats of all ages but is more common in those over six months of age.

Symptoms.—The onset in milking goats is usually marked by a sudden drop in milk yield, loss of appetite and severe diarrhoea; sometimes bloodstained. The diarrhoea is often accompanied by persistent straining and there appears to be considerable abdominal pain. Death usually occurs within 36 hours of the commencement of diarrhoea and is usually accompanied by convulsive struggling.

Putrefaction sets in rapidly after death and in particular the kidneys become decomposed and "pulpy"—hence the popular term "pulpy kidney disease" in connection with sheep.

Diagnosis.—The diagnosis can be definitely confirmed by examination in the laboratory of the contents of the small intestine. This material should be collected **immediately** after the death of the animal. The small intestine should be tied at its junction with the fourth stomach and again where it joins the caecum or blind gut. This section is then removed and squeezed between the fingers so that the contents are forced to one end where they can be transferred to a suitable glass jar or other container. As a preservative a few drops of chloroform (½ c.c. to every 100 c.c. of bowel contents) should be added. This should then be forwarded to the Veterinary Pathologist, Department of Agriculture, Perth, without delay.

Treatment and Prevention.—For treatment of the disease, that is where deaths have already occurred, Pulpy Kidney Anti-

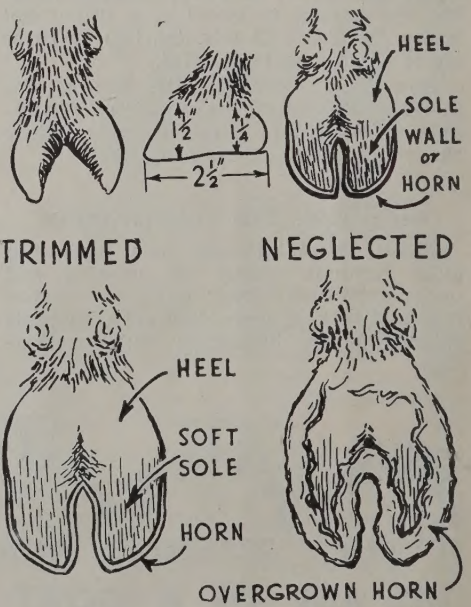


Fig. 3.—The hooves should be kept trimmed, and the top drawing shows the approximate proportions of a sound foot. Overgrown horn may cause lameness or lead to foot infections

toxin obtainable from the Commonwealth Serum Laboratories, may be injected into the remaining animals in doses or 20 c.c. or more intramuscularly or subcutaneously.

For prevention, 4 c.c. of the anti-toxin may be given subcutaneously to kids and from 5 to 10 c.c. to larger animals.

The anti-toxin, although it confers protection on the animal almost immediately, only confers such protection for a relatively short period; two or three weeks. The anti-toxin also is comparatively expensive. Consequently where enterotoxaemia is likely to occur it would be preferable to vaccinate animals with enterotoxaemia vaccine which produces a much more durable immunity and is a more economical and practical procedure than the use of anti-toxin. It does however, take several weeks before the immunity is sufficiently developed to withstand the disease when exposed to infection.

Since goats do not respond to vaccination as readily as sheep it is advisable to give a second dose four weeks after the first injection. The dose in both cases is 5 c.c. injected subcutaneously beneath the skin of the thigh or brisket.

A warning should be given here in connection with the all-white Saanan breed. These animals appear to have an idiosyncrasy to vaccines and it is possible for collapse, abortion and death to occur when vaccination is carried out on them.

GOAT POX.

This is due to a virus, very similar to the virus causing cow pox. Goats of all ages are susceptible but older animals are more commonly affected. The virus is present in the crusts covering the sores and infection spreads by direct or indirect contact. The usual course of the diseases is about three weeks and the incubation period from one or two days to a week.

Symptoms.—It is generally a fairly mild condition but loss of appetite and fever may occur. Small reddened areas first appear on the teats and udder. These later become raised as watery blisters and progress to pus-filled pox sores. After a few days these are replaced by scabs, which finally fall off leaving white sunken areas.

Goat pox is transmissible to humans and usually affects the hands. One attack in the goat produces a lifelong immunity against further attacks.

Treatment.—Affected animals should be separated and, if in milk, should be milked last. The milk is considered unsafe for several days before and after the vesicle formation. Salicyclic acid ointment as recommended for sore teats should be applied twice daily.

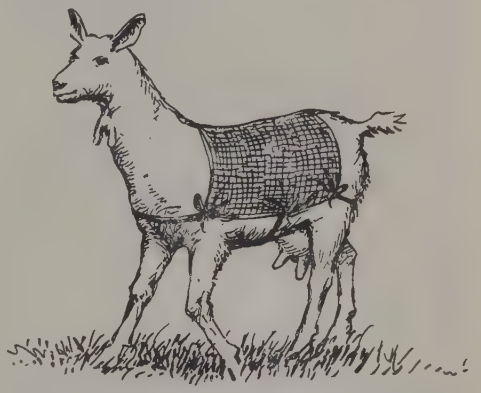


Fig. 4.—Sick goats will sometimes benefit by being rugged if the weather is cold. A cornsack will often serve the purpose

CYSTITIS (INFLAMMATION OF THE BLADDER).

Cystitis is a condition which occasionally occurs after kidding but may occur at other periods.

Symptoms.—The main symptom is constant straining, with the passage of small quantities of urine. Scalding of the skin surrounding the breech occurs, and the urine is often cloudy and may contain pus or blood clots.

Treatment.—If veterinary assistance is not obtainable, half a teaspoonful of bicarbonate of soda in barley water and 1oz. raw linseed oil daily may be administered as a drench, or two Rexamene tablets (5 grain) may be given twice daily for five days.

OPTHALMIA (PINK EYE).

This condition is caused by minute organisms known as *Rickettsias*. It is a contagious disease spread by flies and by contact with the discharges from affected eyes.

Symptoms.—A watery discharge is usually the first sign of this disease. The mucous membranes of the eye become intensely congested and, because the cornea of the eye is infected, there is usually a bluish-white film over the eyeball. In severe cases the eyeball may rupture. Depending, too, on the severity of the condition and the success of any treatment, there may be temporary or permanent blindness. Milk production drops and there may be a rapid loss in the condition of the animal.

It is most likely to occur in the warmer months when flies are prevalent.

Treatment.—The most effective treatment is chloromycetin eye ointment squeezed into the eye night and morning. If the treatment is commenced in the early stages, one day's treatment may suffice, but more severe cases may require treatment for three or four days.

Penicillin eye ointment and sulphacetamide eye ointment are also satisfactory preparations to use for treatment.

Where none of the above preparations is available, bathe the eyes twice daily in a solution of one teaspoonful of common salt to one pint of water and then place a few drops of 10 per cent. argyrol in each eye.

RINGWORM.

This condition is caused by a fungus which affects the hair fibres and follicles causing the hair to fall out, leaving circular bare areas. It is usually seen in badly-nourished animals and is readily transmitted by contact to other goats.

Treatment.—The affected areas should be thoroughly washed with warm water to which has been added one tablespoonful of washing soda to every gallon of water. When dry, apply a 2 per cent. solution of sodium hyposulphite (photographic "hypo") or ordinary tincture of iodine to the bare areas. Treatment should be continued until the infection appears to have been overcome, when short new hairs may be seen on the bare patches.

WORM INFESTATION.

Heavy worm infestation may be responsible for serious losses of condition and lowered production. As with sheep, it is the young animals that are most likely to suffer heavily from internal parasites but certain types of worms, particularly the large stomach worms, may cause mortality in older animals.

Symptoms.—The most common symptom is a progressive loss of condition, but this symptom may be overlooked if animals are on a poor diet. In severely-affected goats, loss of condition may progress until a state of emaciation is reached. While diarrhoea is frequently present it does not necessarily appear as a constant symptom. The type of worm present generally determines the presence or otherwise of diarrhoea. There is usually a progressive reduction in milk supply, gradual loss of appetite and harsh staring coat. In the case of stomach worm infestation there may be a swelling under the jaw—the so-called "bottle jaw"—and a severe anaemia.

Treatment.—Before treatment is carried out, veterinary examination of the droppings in order to determine the type and extent of infestation is desirable.

For most of the stomach and intestinal parasites which are likely to be encountered, phenothiazine is the most efficient drug to use. This is sold under various proprietary names and can usually be obtained in 1 lb. and 7 lb. packets. The phenothiazine is mixed with water to form a suspension and directions regarding mixing are supplied with the preparation. The suspension is given as a drench in the following dose rates:—

Adults—1½oz. powder.

12-18 months—1oz.

8-12 months—¾oz.

3-8 months—½oz.

Does should not be treated within four weeks of kidding, but should be treated about two weeks after kidding. Kids should be treated when they reach three months and all doses should be repeated after an interval of a fortnight. Following dosing with phenothiazine there may be a red pigmentation of the skin in white goats after two or three days. This pigmentation is not harmful but it may persist for some weeks.

Prevention.—Prevention of worm infestation is far preferable to treatment. Overstocking of pastures is dangerous and the avoidance of moist damp areas is most important. If this cannot be carried out animals should be treated with phenothiazine every six to eight weeks.

Good feeding helps to control the ill effects of worm infestation.

DIARRHOEA.

In adult goats this trouble is likely to be due to worms, ingestion of certain weeds or too rapid a change from one feed to another. In kids it may be due to worms or careless feeding.

Worms are dealt with elsewhere in this article. When diarrhoea is due to other causes, removal of the cause and correct attention to hygiene and good animal husbandry practices are important. Persistent diarrhoea is most exhausting to the animal, resulting in considerable loss of condition and should be treated promptly.

Treatment.—A mixture of bicarbonate of soda, charcoal, prepared chalk, and ginger (four ounces of each), is useful. This is given in doses of one tablespoonful twice daily mixed with a little water. Where there appears to be considerable pain, 10 drops of chlorodyne may be added.

Where scouring persists, veterinary attention should be obtained if possible. Sulphaguanadine tablets (0.5 grams) are often effective in the treatment of diarrhoea, the dose being six tablets initially, followed by three every three hours.

LICE.

Goats may be infested with two types of lice—biting and sucking types.

Infestation can occur at all ages, but kids are the most susceptible. In adult animals it is usually the weak and unthrifty that suffer a heavy infestation.

Lousy goats have a rough appearance due to constant rubbing against projecting objects in an attempt to relieve the irritation.

The eggs are laid in a sticky secretion which mats the hair together. Hatching occurs in one to two weeks and the adult stage is reached in a further three to five weeks. Although it is normal for lice to spend the whole of their lives on the goat, under favourable conditions they may survive off the host for up to 18 days, so that clean animals may become infested through indirect contact. As with lice in other animals, infestation is usually heaviest in the autumn and winter months.

Treatment.—Sucking lice are more difficult to kill than the biting lice. DDT and Gammexane are both effective against these parasites and these preparations have a residual value which prevents reinfestation for some days following treatment.

DDT can be used as a spray (1 per cent.) or as a powder (10 per cent.). Particular care should be paid to the flank and neck regions.

Gammexane emulsion or suspension as prepared for the treatment of sheep is also very effective.

CASE

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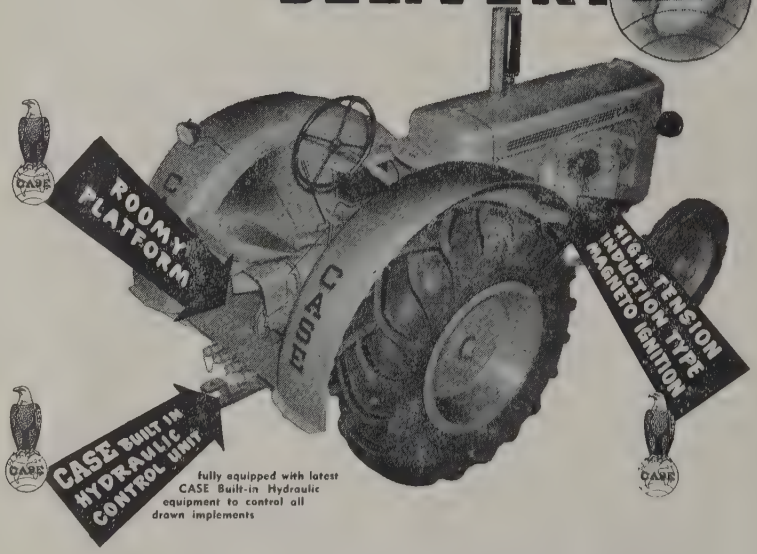
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Fig. 1.—A useful method of holding small pigs for the operation. The animal is held by the hind legs and swung between the holder's legs where it is held firmly by pressure of the knees

CASTRATION OF CALVES AND PIGS

CONTRIBUTED BY THE VETERINARY BRANCH

THE routine castration of calves and pigs is in most cases carried out by the stockowners themselves, many of whom have attained a high degree of skill and perform the operation in a humane and hygienic manner. On many farms, however, the work is done crudely, and the purpose of this article is to give a brief outline of the operations so that they may be carried out expeditiously with the minimum of risk to the animals.

Calves are usually castrated at about five to six months old, although, where necessary, the operation may be performed later. With all animals, the castration is best carried out at an early age as shock is kept to a minimum and there is less risk of haemorrhage. As a result there is little check in growth.

Calves may be castrated in a standing position, in which case they are held firmly against a stout fence or the side of a crush. Alternatively they may be laid on their sides, care being taken to choose a clean site. This should preferably be an unfouled grassy area, and certainly not an old yard where the soil may be heavily charged with infective matter.

The only instruments required are a knife (preferably of the one-piece type) and an emasculator (Fig. 5).

These should be sterilised by boiling for ten minutes, care being taken to wrap the knife in a cloth to protect the blade. They should be boiled and left

Figs. 2 and 3.—Two other methods of holding the animal

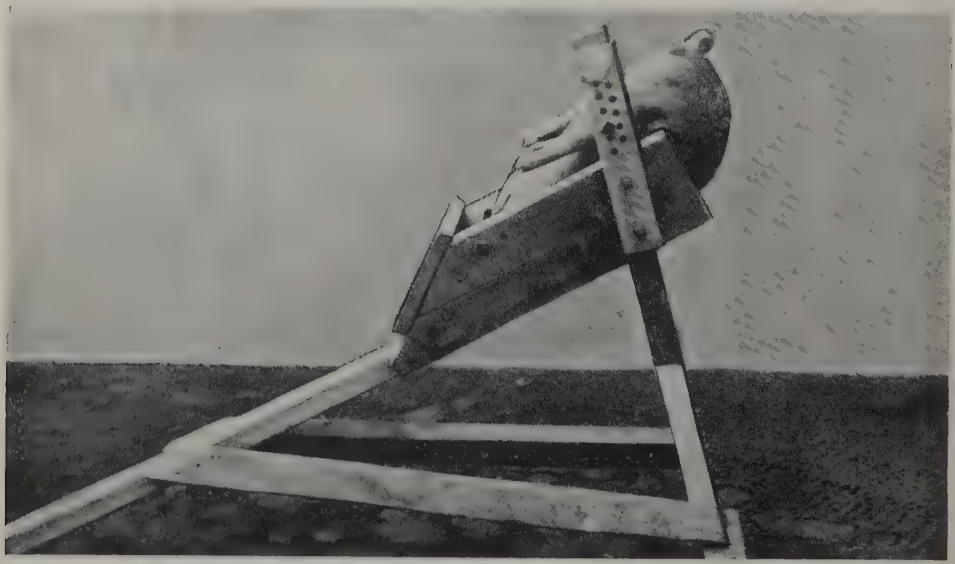


Fig. 4.—A cradle which enables the operator to work without an assistant to hold the pig. The animal is placed head downward in the cradle and held by a long bolt which passes behind the hocks. A series of holes in the side-pieces allows the position of the bolt to be altered to suit the size of the animal

in the water until cooled sufficiently for use. Lysol or Dettol (1 tablespoonful to 1 pint of water) may be added and the instruments kept in the solution when not actually being handled during the operation.

Method of Operation.

At least two persons are needed, one to operate and one to hold the animal to prevent it from moving.

The scrotum or purse is swabbed with a disinfectant solution. That described for the instrument bath would be suitable. The area is then dried off with a squeezed-out swab.

The testicle on the side farthest away from the operator is grasped between the forefinger and thumb of the left hand (assuming that the operator is right-handed) and a bold incision is made in the scrotum. The cut is made from the rear, downwards towards the front, and should divide the skin on the lowest portion of the scrotum so that good drainage is assured with the animal in a standing position. The incision should be deep enough to enter the fleshy portion of the testicle, thus liberating it from the envelope in which it is normally situated. The length of the cut should be such as to permit the testicle to be drawn out without difficulty.

As the testicle is drawn out, it will be seen that it is held by a fairly thick cord tapering off to a thin band of tissue towards the rear of the attachment. Divide the thin tissue with a snick of the knife and the testicle will hang limply, free from muscular interference.

If the emasculator is being used, the instrument is then applied to the cord with the crushing portion nearest the animal's body. The jaws are closed and held firmly for several seconds, crushing the tissues before severing the cord so that haemorrhage is almost negligible.

Where no emasculator is available, the cord should be scraped through with a knife, while a certain tension is maintained on the testicle. The cord should not be cut cleanly but the tissues frayed by scraping until the testicle is freed. A clean cut is liable to be followed by extensive haemorrhage.

The second testicle is removed in similar manner to the first, through a separate incision in the purse.

Bloodless Castration.

There are castrating instruments on the market which operate by crushing the cord without cutting the scrotum—the "Burdizzo method" as it is generally called.

It does away with much of the risk of infection, but is somewhat slower than the knife where large numbers of

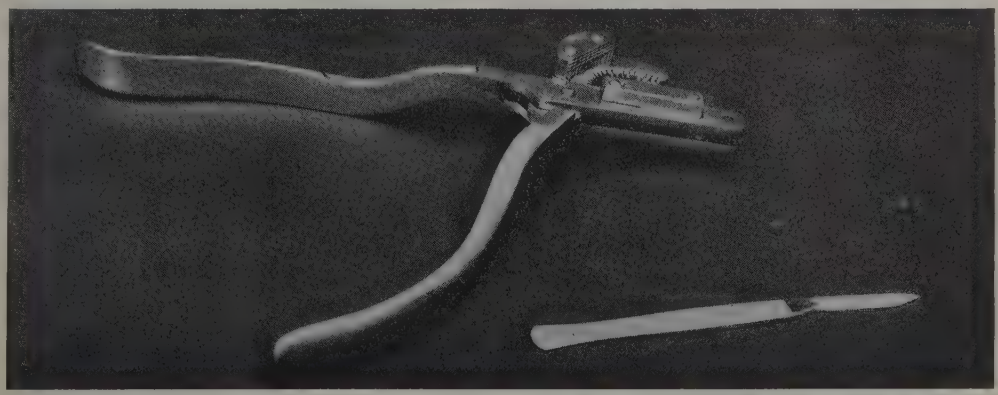


Fig. 5.—The triple-crush emasculators shown here are recommended for the castration of older animals. They crush the tissues before severing them, and tend to arrest severe bleeding. The type of scalpel or knife illustrated is ideal for desexing young animals. Being of one-piece, all-metal construction, it is easy to handle and may be effectively sterilised

Fig. 6.—Pressure of the thumb and forefinger brings the testicle into position for the operation

Fig. 7.—A bold incision is made commencing high up towards the hocks so that there will be free drainage when the animal is in the normal standing position

Fig. 8.—Pressure causes the testicle to pop out

Fig. 9.—The thin band of tissue—which is at the rear of the testicle when the animal is in its normal position—is severed by a touch of the knife

Fig. 10.—The cord is not cut cleanly as it contains large blood vessels, the rapid severance of which could lead to serious bleeding. Slight tension is maintained and the cord is frayed through by a series of scraping movements

Fig. 11.—The operation completed

animals are to be treated. It is less positive in its action too as any carelessness or lack of skill on the part of the operator may lead to the cord not being properly crushed. Should this occur the testicles would remain at least partially active instead of becoming atrophied.

Another method, elastration, is preferred by some farmers. A rubber ring is fitted over the purse by means of a special instrument. The ring acts as a tourniquet and cuts off the blood supply to the parts which eventually slough away.

PIGS

The castration of male pigs is an important operation on farms where pigs are raised for market as well as on stud farms. It enables the farmer to control the breeding operations on his property and the castrated animal yields a carcass with flesh of a much finer grain and quality and free from sexual flavours and odours.

Fig. 12.—Using the emasculators. The crushing portion of the instrument is nearest to the pig

The best age at which to castrate pigs is from four to six weeks whilst still suckling the sow. At this age, the animals can be handled easily and the testicles are large enough to be removed without difficulty.

A knife, as previously described, is the only instrument required for young pigs, but for older animals an emasculator is also necessary. The same precautions regarding sterilisation of instruments apply as in the case of calves and a dry cool day is preferred for carrying out the operation.

It is desirable to starve the animals for at least 12 hours (overnight) before castrating them.

Except where the cradle (Fig. 4) is used, two persons are required, one to operate and the other to hold the pig. When handling large numbers of pigs, the holding method shown in Fig. 1 will be found both speedy and convenient. Other methods of holding are shown in Figs. 2 and 3.

The operation is essentially the same as in calves, an incision being made in the scrotum and into the testicle so that it pops out. The incision is made in such a position that when the animal stands, the incision will be facing the ground to facilitate drainage, and so lessen the danger of complications. The cord is severed by scraping, but in the case of older animals the emasculators should be used to obviate the risk of haemorrhage.

When the operation is completed the pig should be placed on the ground, forelegs first if possible, in a clean paddock. If the animals can be placed on fresh green pasture and left there for an hour or so until a firm blood clot develops over the wound, they may be taken back to a clean dry sty with far less risk of infection.

The pigs should be carefully watched and if any infection does occur at the site of the wound, the animal should be caught and the area fomented with warm antiseptic solution such as 2½ per cent. Dettol solution (1 tablespoonful to 1 pint of water). If the abscess is large it should be opened at the lowest point with a knife and washed with the warm Dettol solution two or three times a day until healing occurs.

The castration of pigs with hernia (rupture) is more difficult and should be carried out by a veterinarian. It is usually more economical to have the animal slaughtered.

VETERINARY CADET'S SUCCESS

Gosnells Man Becomes First Graduate

ADVICE has been received from the Dean of the Faculty of Veterinary Science, at the University of Sydney (Professor H. R. Carne) that Mr. John Morrison Armstrong, of Gosnells, Western Australia, has graduated with 2nd Class Honours, passing in all subjects and gaining a credit in veterinary jurisprudence.

This was announced by the Minister for Agriculture (Mr. E. K. Hoar) who said that he wished to congratulate Mr. Armstrong on being the first successful candidate under the State Government's veterinary cadetship scheme.

When the scheme was inaugurated in 1949 said the Minister, it was hoped that it would provide two veterinary surgeons annually for the Department of Agriculture over a five-year period commencing in January, 1954.

Owing to a series of failures in the annual examinations at the Sydney University, these hopes have not been realised.

Mr. Armstrong will join the Department of Agriculture as a veterinary surgeon early in 1954 but no further graduates will become available until 1957.

The Minister said that the Government's cadetship scheme could materially assist young men desirous of entering the veterinary profession. Details of the scheme could be obtained from the Chief Veterinary Officer of the Department of Agriculture (Mr. C. R. Toop).

HUMANE TRAP FOR VERMIN

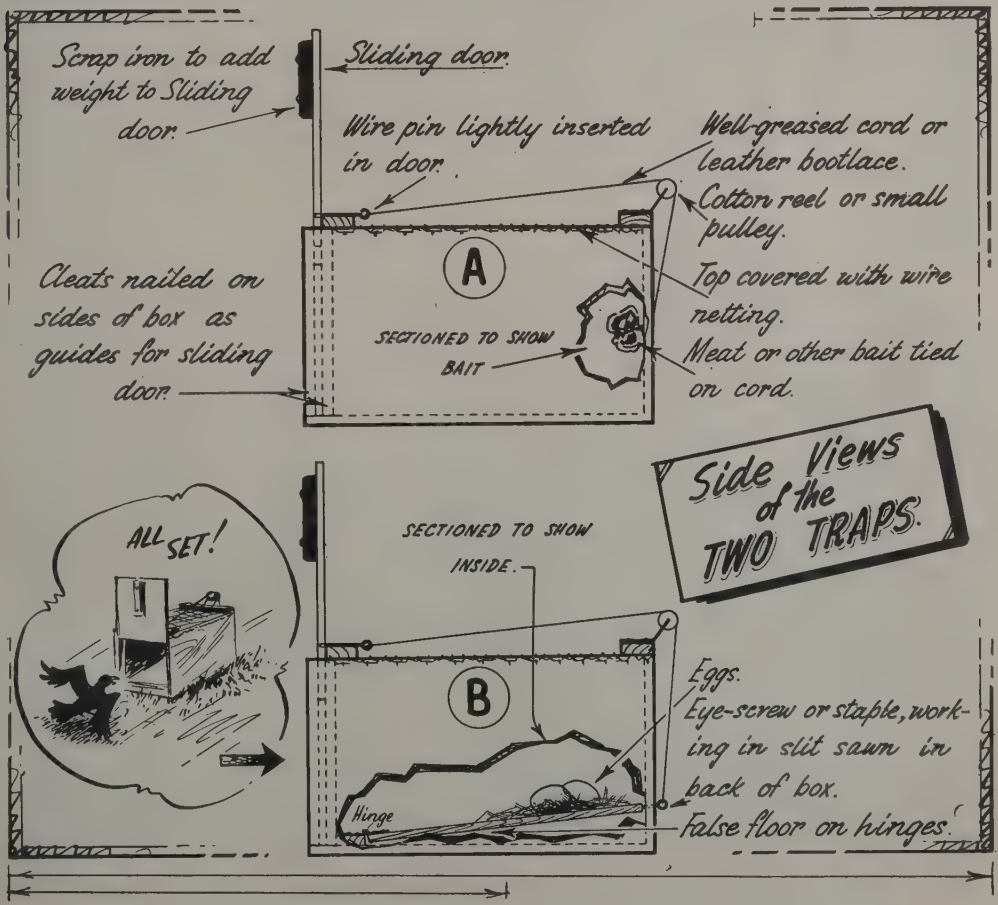
Dealing with the Wild Cat Menace

By J. A. MALLETT

SEVERAL requests for advice on trapping wild cats have been received this season mainly from poultry-farmers, who report heavy losses of chicks. The killers are usually the descendants of domesticated cats which have "gone bush" although occasionally the spotted "native cat" or chuditch will raid poultry houses.

Probably the best method of dealing with these pests is the box trap (A). Setting rabbit traps to catch cats is a barbarous practice and such traps are dangerous to domestic pets, poultry and harmless birds. Poison baits are equally unselective in their action.

The box trap is easy to make, is most effective in operation and does not injure the animals it catches. Any harmless captures may be released unhurt, while the real culprits can be painlessly dispatched by a bullet before being removed from the trap.


Scrap iron to add weight to Sliding door.
Sliding door.
Wire pin lightly inserted in door.
Well-greased cord or leather bootlace.
Cotton reel or small pulley.
Top covered with wire netting.
Meat or other bait tied on cord.
Cleats nailed on sides of box as guides for sliding door.
A
SECTIONED TO SHOW BAIT
Side Views of the TWO TRAPS.
ALL SET!
SECTIONED TO SHOW INSIDE.
B
Eggs.
Eye-screw or staple, working in slit sawn in back of box.
False floor on hinges.
Hinge

Incidentally if you catch any of our rarer native animals, do not kill them, but send them to the Zoological Gardens.

CONSTRUCTION

Any well-made wooden box will serve as the body of the trap—a kerosene-case is ideal.

Carefully remove the lid and one end of the box, and nail two strips of wood across the top as shown in Diagram A—one at the back to carry the pulley, and the other about 1½in. from the open end.

Cut portion of the lid into half-inch strips and screw two cleats on the inside of each of the box sides, far enough apart to allow the door to slide freely between them.

The end of the case will serve as a sliding door, but it is advisable to screw a piece of scrap metal to the front to give the extra weight needed for a quick drop. Plane the edges smooth and smear a little grease along the channel in which the door slides.

The top of the trap is covered with wire netting, and a small pulley, or a cotton-reel, is fixed in position, as shown, in the centre of the rear strip.

The door is held in the "up" position by a pin made from a long nail or a length of No. 8 wire bent over to form an eye. This pin fits lightly into a hole bored in the door. A length of well-greased cord or a leather bootlace is tied to the eye of the pin and passes over a pulley, then down through a hole in the back of the trap. A piece of meat or other suitable bait is attached to the end of the cord.

The trap is set so that the slightest pull on the bait withdraws the pin and allows the door to drop.

CATCHING CROWS

At one time, while farming in the wheatbelt, I found that crows were stealing most of the eggs laid by my fowls, so I modified the box trap design to catch those wily birds. (See Diagram B.)

When stealing eggs they tended to ignore the meat baits, so I put a false floor in the trap, and hinged it to a strip of wood nailed across the front. An eye-screw or staple was fixed in the end of the false floor and a slot was cut in the rear end of the trap to allow the eye-screw to move freely up and down.

A nest containing one or two eggs was placed on the false floor and the trap was then lightly adjusted so that any extra weight on the floor caused the pin to be withdrawn and allowed the door to drop.

The idea worked well and, after a few crows had been killed and their bodies hung up near the sheds, the egg-stealing ceased.

On one occasion I caught a goanna which favoured an egg diet, while the frequency with which the chooks sprung the trap, when taking advantage of what appeared to be a cosy nesting-site, suggested that the idea might be adapted to trap-nesting.

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"BUFFEL GRASS—WHAT IT HAS DONE FOR MUNDABULLANGANA"

By W. M. NUNN, B.Sc. (Agric.), O.I.C. North-West Branch

BUFFEL grass (Cenchrus ciliaris L.) was described by Mr. H. Suijdendorp in a recent issue of this Journal, but a good deal more can be said, mostly per the medium of illustrations, concerning the achievements already attained with this grass in reclaiming areas of eroded and part eroded country and returning it to profitable grazing.

Mundabullangana, or Munda. as it is commonly called for obvious reasons, is one of the best known and most efficiently-run properties in the predominantly spinifex region of our North-West.

Situated on the coast between Port Hedland and Roebourne, it covers three-quarters of a million acres. The 480,000 acres at present stocked, are subdivided into 53 paddocks with 80 watering points, and carry 30,000 sheep.

The manager for Mundabullangana Pastoral Company, Mr. R. Lukis, estimates that he has 60,000 acres of Buffel grass similar to that shown in illustration No. 1.

Asked recently for some figures which would illustrate the quality and carrying capacity of this pasture under fair seasonal conditions, Mr. Lukis wrote:—

> "In 1950 we paddocked 19,000 ewes for mating on 11,000 acres for five weeks. We then cut quite a few tons of meadow hay from that paddock and left 3,000 ewes in there for a further four months.
>
> "Last year we ran 13,000 mated ewes on the same area for the same period. In both these instances we had good snap lambing results, and the paddock

Fig. 1.—Mundabullangana Station has 60,000 acres of Buffel grass country like this. The grass had been well eaten back when this photograph was taken

Fig. 2.—Mr. Lukis standing in a good patch of mixed Buffel and Birdwood grass pasture, after winter rains in 1952

in question remained green and in better heart than all the other paddocks, and for at least two months longer than other paddocks, as a result of the heavy feeding back."

This, you will agree, sounds rather more like grazing procedure to be expected in agricultural areas than in a pastoral region with a haphazard rainfall averaging 13 inches a year.

Munda. was first taken up about 1870 by Mr. A. R. Richardson, who moved on almost immediately farther up the coast to make his home at Pippingarra, leaving the McKay family to develop the former property.

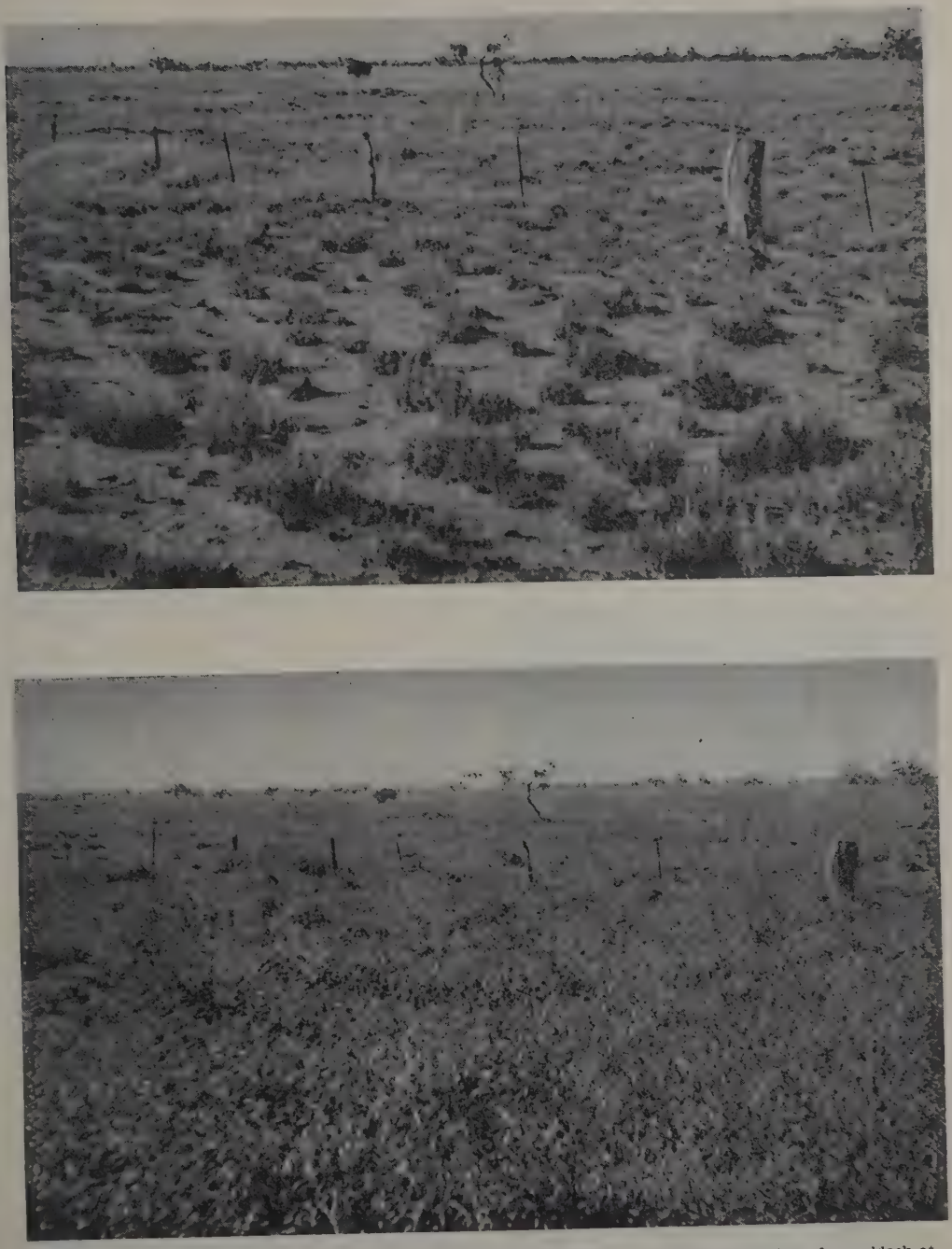
About 1925, Munda. was purchased by the Craig Bros., and it was under that ownership that most of the present Buffel grass areas became established.

Buffel grass was identified in our North-West as far back as 1910 and appears to have arrived by accident, probably in fodder brought from South Africa for the early camel teams. Its value was recognised by pastoralists, and active steps have been taken by a number of stations to collect seed and assist the spread to new areas.

Large stretches of coastal country which carried weeping grass, bundle-bundle, button grass, chintiby and pigweed—all considered good feed in the early years—were bare and actively eroding when the Craig Bros. commenced their programme of Buffel distribution. Various methods were used to broadcast the seed, and it is understood that in 1927 and 1928 pilots of Western Australia Airways Ltd., assisted with some aerial sowings.

Most of the areas which were a worry at that time are now carrying a splendid stand of Buffel grass, varying of course with the seasons, but rating always among the highest carrying capacities for the district.

Mr. Lukis is still worried about areas of "scalded" country which appear to be spreading, but these are now in spinifex country which does not take Buffel grass so readily as the original native grass areas. He is pursuing an active programme, however, and with effective co-operation from Agricultural Adviser H. Suijdendorp, he is finding that with assistance in the way of cultivation to provide cover for seed and to check surface run-off of rains, Buffel grass will spread through a lot of country in which it did not become established after early broadcasting methods.

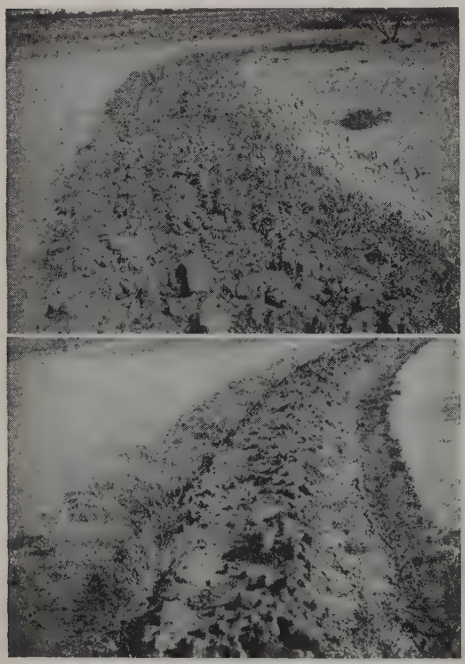


Figs. 3 and 4.—Two photographs of the same patch of country. The top picture shows portion of a paddock at Munda. Station after heavy grazing in a dry summer. The lower picture shows it after the grass had responded to early winter rains. The irregular ground surface in the background is the result of wind erosion prior to the introduction of Buffel grass

Illustrations show the type of country now being reclaimed by Buffel grass and something of the methods employed to get it established.

Agricultural Adviser Suijdendorp is equipped with a Ferguson tractor and its various attachments. He has tried furrowing the scalded areas on a checkerboard system and, where there are appreciable slopes, on the contour. The illustrations leave no doubt that the furrows lead to local establishment of the grass, and there is every hope that from these points it will spread, to give increasing ground cover and lead to ultimate reclamation of now useless bare claypan.

Fig. 5.—Buffel grass has established itself on the "pedestals" but has been unable to gain a footing on the bare, eroded surface of the claypan



Figs. 6 and 7.—Where contour working was carried out, the Buffel grass established itself on the barest, hard, claypan surface

Fig. 8.—Buffel grass seed was broadcast over the whole foreground but established itself only on the cultivated strip

Although it seems impractical to suggest using a tractor and cultivating implements on million-acre pastoral leases of low carrying capacity per acre, when one considers that Munda. paddocks at present enclose something like 20,000 acres of bare claypan, and that Buffel grass on the same station in adjacent paddocks, is providing meadow hay after having carried 19,000 ewes on 11,000 acres for five weeks, the effort begins to look worthwhile.

Fig. 9.—Ten-weeks-old Buffel grass plants in test rows at Woodstock Station, 100 miles inland

In addition, it must be remembered that the 20,000 acres of claypan is actively spreading. If unchecked there is no limit to its ultimate extent. If sown to Buffel grass and properly managed, it can have a steady carrying capacity year after year.

We know of one claypan on another station in the Port Hediand area, which covers 25 square miles of country which originally carried good, edible, soft spinifex. The present pan surface is 5ft. below the earlier spinifex level. This will be the fate of the many small bare areas which are to be found throughout the Hedland region if corrective measures are not taken to prevent them linking up into progressively larger expanses.

Buffel, and its near relative, Birdwood grass, should be sown at a rate equal to about 3 lb. per acre, but it is important that the seed should be mature.

It remains dormant for some time after harvesting, and germination figures as low as 2% have been obtained with tests of new season's seed. If stored for a year or so a 70% germination can be expected.

The seed will naturally blow from denuded surfaces, and establishment can be expected only where it has a change to lodge in some protected crevice in a broken surface or among plant debris.

Cultivation with any implement, prior to broadcasting the seed assists in establishment and, if the seed is sown in this way in strips throughout the region to be grassed, it will gradually spread itself over the intervening spaces.

Buffel grass is doing a wonderful job for Munda., and station managers in the vicinity would do well to acquaint themselves with the trials in which Mr. Lukis and Mr. Suijdendorp are co-operating, in their efforts to induce the grass to spread to other areas.

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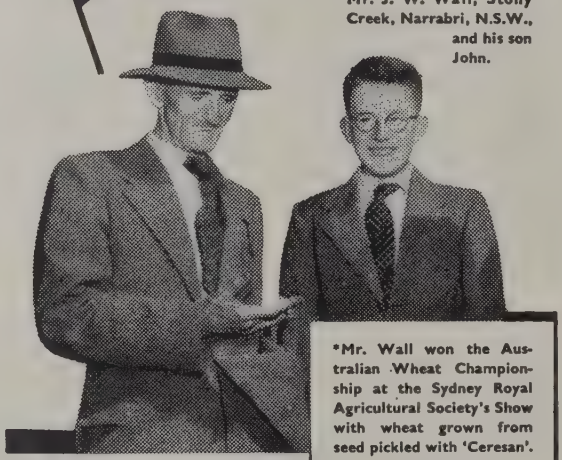

* Mr. J. W. Wall, Stony Creek, Narrabri, N.S.W., and his son John.

*Mr. Wall won the Australian Wheat Championship at the Sydney Royal Agricultural Society's Show with wheat grown from seed pickled with 'Ceresan'.

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HOW TO PRODUCE CLEAN MILK

By J. T. McNALLY, Dairy Instructor

ALTHOUGH every dairy farmer would like to be the possessor of soundly-constructed dairy premises and a complete set of up to date equipment, many are compelled to use buildings and equipment which fall far short of this ideal. Even with limited facilities however, the production of clean good-quality milk is neither difficult nor impossible, provided that the farmer applies the knowledge of dairy hygiene which is readily available to him.

Whatever else may be lacking there are two items which must be freely available if clean milk is to be produced. The first is an abundant supply of clean water at the dairy shed; the second is an ample supply of boiling water, and this calls for a 12-gallon copper or its equivalent as the minimum water-heating equipment for normal needs.

Other important requirements for satisfactory dairy hygiene are:—

Suitable washtroughs.

A good drainage rack, preferably constructed from piping.

A supply of sound brushes with the necessary cleaning compounds such as washing soda or soda ash for the utensils and caustic soda for the milking machines.

If the farmer has the equipment mentioned above and follows a few basic rules he should have no difficulty in producing clean, high-quality milk. If his milk output is below standard in quality, study of the following rules should put him in a position to bring about an immediate improvement in the quality of the product.

1. All cows in the herd should be sound and healthy.

2. Should a cow develop symptoms of mastitis, apply penicillin treatment to the affected quarters immediately. Discard the milk from these quarters and do not use it until the infection is entirely eliminated. Even when the quarter and the milk appear normal, the milk should be discarded for at least five days after the last injection.

3. In order to detect mastitis infections before the disease becomes serious, test the foremilk from each teat. A strip cup fitted with a fine black gauze or a piece of black cloth over the cup helps in detecting clots or other abnormal milk conditions which provide evidence of udder trouble.

4. Always wash the udders and teats, using a clean cloth which has been moistened with a weak chlorine solution.

5. Do not feed strong-smelling food or allow the cows access to rank weed growth for at least two hours prior to milking.

6. After milking, wash and scald the udder cloth and hang it up to dry. Wash and scald strip cups and other utensils used.

7. Provide facilities at the dairy for washing the hands of the milkers, and practise dry milking if the milking machine is not in use.

8. The thorough cleaning and sterilising of dairy utensils is the most important factor in the production of high-quality milk.

Immediately after milking, rinse all utensils with ample cold or lukewarm water to remove the milk. Next wash thoroughly with warm water to which soda ash or some similar cleanser has been added, and after thoroughly cleansing both the inside and the outside of the utensils immerse them in boiling water or sterilise by steam if steam treatment is available.

All utensils should then be inverted on a draining rack situated in a dust-free portion of the building. Do not use cloths to

dry dairy utensils; use good quality brushware for washing up, and keep this brushware clean and sweet at all times.

9. The milking machines should be rinsed through with cold water immediately after milking and the rinsing should be continued until the water comes through clear. Next put through at least a gallon per unit of a solution in which caustic soda has been added to boiling water at the rate of a teaspoonful to each four gallons of water. Finally rinse well with clean boiling water, again using not less than a gallon to each unit, dismantle and allow to drain and dry.

In addition to the daily cleansing routine, dismantle the milking machine at least once a week and thoroughly clean and sterilise all parts. Flush out and sterilise the air-line as often as necessary.

10. When cans are returned from the factory, they should be emptied, thoroughly cleaned and sterilised and then placed on the rack to dry. All milk cans and other utensils should be kept in good repair and should be re-tinned or replaced when damaged.

11. Renew all rubber ware as required.

12. Sweep and wash down dairy premises daily and ensure that all manure is removed from the yards each day. Do all that is possible to abate the dust and mud nuisances.

13. Limewash all buildings inside and out at least twice a year. The use of tar is permissible and it is recommended that the lower three to four feet of the walls in the milk shed and bails should be treated with this substance.

14. Immediately after, or during milking, cool the milk as much as possible, preferably to a temperature of below 60° F. and keep it cool until it is transported to the factory. Do not mix the hot morning milk with milk that has been held overnight.

While awaiting transport, store the milk in a clean place and in a cool position out of the sun.

15. At all times protect dairy produce from contamination by flies, dust, animals or strong-smelling substances. Never expose it to direct sunlight. Finally keep your milking shed and dairy tidy, using the buildings exclusively for dairy purposes and not as general store rooms.

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WESTERN AUSTRALIAN GOVERNMENT RAILWAYS

AERIAL BAITING AGAINST WILD DOGS AND FOXES IN WESTERN AUSTRALIA

By A. R. TOMLINSON, Chief Vermin Control Officer

THE history of aerial baiting against wild dogs in this State dates back to July, 1946 when an experimental aerial baiting scheme was conducted by the Meekatharra Vermin Board in conjunction with the Department of Agriculture using an aeroplane supplied by Airlines (W.A.) Ltd. The operations lasted for three days and covered portions of the Meekatharra Vermin District in the inland of the North-West of Western Australia. A Department of Agriculture dogger travelled on the aeroplane to direct and assist. He had visited the areas on which baits were dropped before the baiting flight and travelled through them again after the baiting. He found only one carcass, but reported the tracks of dogs were much fewer than before the baiting.

It was considered that the results obtained justified further trials, but some difficulty was experienced in obtaining supplies of suitable baits. These were required in large numbers and had to be suitable for storing for long periods.

By mutual agreement, the Queensland, Commonwealth (for the Northern Territory), and Western Australian Governments decided in 1947 to make available the sum of £5,000 each for the carrying out of aerial baiting, primarily as an experiment to ascertain the value of this work.

In Western Australia it was decided that the £5,000 should be spent over a four-year period and that the experimental work would be carried out over the North-West and inland areas. Later it was decided to reduce the period to three years and to increase the sum advanced to over £8,000.

Preparations were commenced immediately for a small fight to be carried out in the Wiluna area in January, 1948, in which a distance of about 900 miles was to be flown and 35,000 baits to be dropped. Unfortunately, heavy rains fell throughout the areas and the flights were abandoned.

It was then decided that a campaign should be arranged for October, 1948. The results obtained on these flights were considered satisfactory and it was decided to continue the campaign in 1949 and 1950. In the 1949 flights, Vermin Boards were allowed to make use of the aeroplane while it was in their vicinity, and the Roebourne-tableland and Ashburton Vermin Boards availed themselves of this opportunity of experimentally dropping baits against dingoes and foxes.

In 1950 the baiting flights were extended to cover the country to the north-east, east and south-east of Laverton, and also to the south of Sandstone. The local Vermin Boards contributed to the cost of some of these flights.

In 1951 a further extension was made to include a flight over the country south of Southern Cross. In this year also, a project

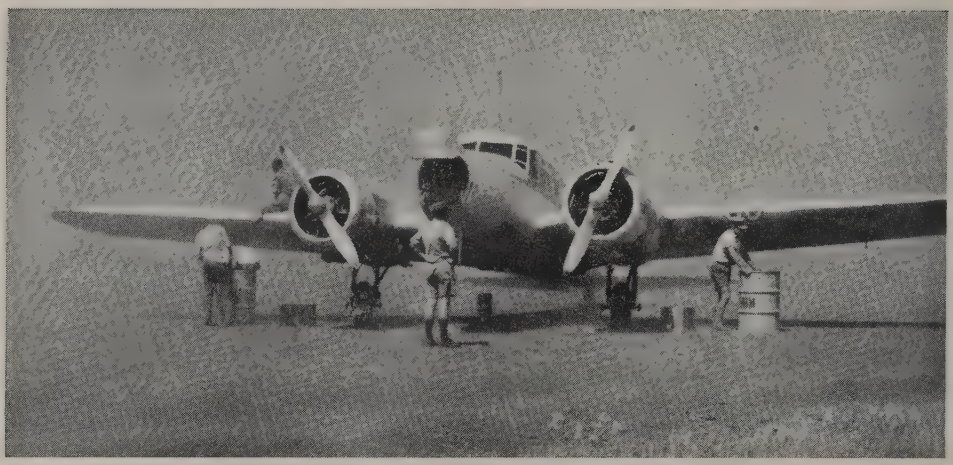

Fig. 1.—Refueling the aircraft in a dust-storm at Ashburton Downs Station

was conducted in the Kimberleys in conjunction with the West Kimberley Vermin Board which carried out a similar project in 1952.

In 1953 an experimental campaign was conducted in the North-West and Eastern Goldfields during May and June. This was timed to coincide with the mating season when dogs are considered to be particularly vulnerable to poison baiting.

BAITS

Experiments carried out early in the aerial baiting campaigns established the fact that fatty substances—particularly if preserved by cooking—made the most suitable baits. Brisket fat was found to be excellent and met all of our requirements such as resistance to heat, keeping qualities and attractiveness to dogs. This information was confirmed by details received from Queensland, where a trial had been conducted soon after the Meekatharra flights. In Queensland, brisket fat baits were dropped in a continuous stream at regularly-spaced intervals, firstly by hand; and later by an automatic device controlled by the pilot.

Following upon the initial flight, arrangements were made for a local firm, David Gray and Company, to manufacture some trial baits from fats, cows' udders and strychnine supplied by the Department of Agriculture. The strychnine used was in half-grain alkaloid tablets, which not only dispensed with the necessity for measuring the lethal dosages (one-third of a grain is sufficient to destroy a dog), but greatly facilitated the large-scale manufacture of baits.

In the earlier campaigns, baits were prepared by processing the meat or fat in boiling brine after which the material was cut into approximately one-inch cubes. Half-grain strychnine tablets were inserted into the centre of each cube which was then wrapped in paper. The cutting, inserting of tablets and wrapping were all done manually. The use of paper wrappings for baits is the procedure followed by many of the Department's most experienced doggers and possesses the following advantages:—

1. Improved handling and keeping qualities as the wrapped baits do not adhere to one another and the air circulates freely between them.

2. The baits are protected against ants and against the elements.

3. Where green paper is used for wrapping, the baits are less likely to attract the attention of birds.

As previously mentioned, brisket fat was found to be the most effective material, but shortages of this substance necessitated the use of udder tissue from cows and sheep. Although many known kills were obtained

with these meats, they did not compare with brisket fat in keeping qualities and general attractiveness.

The brisket fat baits remained soft and undamaged even after being exposed to the sun or held in sealed drums. The paper wrappings became greasy and made the baits attractive to dogs. The other materials were apt to become dry and hard in the sun—although they would often soften after rain. Baits must be placed in sealed containers for coastal shipping and baits other than those made from brisket fat deteriorated very rapidly under such conditions due to the "sweating" which took place in the containers.

In 1951 baits were obtained from the Tropical Dip and Chemical Company, Sydney, which manufacturers them in Queensland. This firm also supplies the Queensland and South Australian Governments. These baits were made of brisket fat and the method of preparation was similar to that of the local process except that the fat was "dry-salted" for three weeks and then boiled for three-quarters of an hour. These baits proved most effective and were used in all subsequent campaigns.

DROPPING OF BAITS

Baits were dropped in batches of from 20 to 80 in number on carefully selected targets. The aeroplane flew at a low level and an observer (the Department's highly experienced Officer-in-Charge of Doggers in the Pastoral Areas) seated in the front, signalled to the operator the number of baits that were required and when they were to be dropped through a chute. Experiments showed that the baits fell almost straight down from the releasing point. There was very little forward movement, and side winds had no appreciable effect. It should be noted, however, that no really strong winds were encountered.

Some Vermin Boards, when using the aircraft, carried out baiting for foxes along rivers, coastal sandhills and around coastal mangrove swamps. Such baits were dropped at regular intervals as there were no specific targets and a maximum coverage was the aim. This method is ideal for foxes harbouring in the North-West coastal sandhills. A stream of baits is dropped on one side of the hills on the outward flight and on the other side when returning. Three baits were dropped each second at 120 m.p.h.; this meant that the baits landed 20 yards apart or about 90 to a mile. This method could be used for wild dogs when water is not scarce; for example, if rain fell earlier than usual or during the mating season.

AIRCRAFT

Avro-Anson seven-seater aircraft were used in all the campaigns. Tenders were called and Airlines (W.A.) Ltd. have carried out all the flying except in the Kimberleys where the MacRobertson

Fig. 2.—Sacks of prepared baits ready to be loaded on the aircraft at Balfour Downs Station

Fig. 3.—Dale's Gorge Creek in the Hamersley Ranges, Tablelands District, as seen from the aircraft

Miller Aviation Company Pty. Ltd., operated. It has been most fortunate that the aviation companies and the pilots have displayed keen interest in the work. This enthusiasm has materially assisted in the success obtained.

BAITING PERIODS

For the main campaigns conducted in the North-West and inland areas, October is considered the most favourable month for two reasons:—

(a) Pups are old enough to move round hunting for food, but are not sufficiently experienced to avoid baits.

(b) This is the driest time of the year in these areas (particularly the North-West) and dogs must concentrate on waters which in most cases are few and far between. To experienced bushmen these waters are readily discernible from the air.

In the Kimberleys, September was selected for the same reasons, although the pups would be younger. However the possibility of earlier rains makes October baiting too risky in these areas.

The mating time is in April-May and during this period the wild dogs are moving over the foothills and plains country away from the ranges and their usual hide-outs. They have not their usual interest in hunting or killing and will pick up baits with much less caution than normally. The experimental campaign conducted in May, 1953, was to ascertain if baiting could be carried out successfully at this time of the year when there may still be a lot of surface water available. As it happened, heavy rains had not been widespread and little surface water was encountered.

TARGETS SELECTED

In the dry season campaigns, the baits are dropped on water-holes, soaks, junctions of dried water courses, gorges in hills and all places where dogs must travel or gather in their search for water and game and in their movements with pups from the breeding areas.

In the mating seasons, the targets are similar in dry conditions but, if surface water is present, baits are dropped along the banks of watercourses or lakes. Targets away from the hills and hideouts are concentrated on during this period as the dogs are moving over the foothills and on the plains.

CENTRES AND FLIGHTS

Bases which are most convenient and most centrally situated in the areas to be baited have been selected. In many cases these have been sheep and cattle stations. The ready assistance and co-operation of the owners and managers of these stations has been a great contribution to the success of the campaigns. In other places, town aerodromes were used and the assistance of local Vermin Boards and others has been given with equal readiness.

Flights have varied in length, ranging up to about 520 miles.

PLANNING AND PREPARATION

With the aid of information obtained from Government doggers, all the flights are carefully planned and plotted on maps, using readily identifiable landmarks, such as high peaks or ranges, watercourses, lakes, homesteads, etc. Mileages are calculated and allowances made for deviations along watercourses, etc. Numbers of baits are estimated. All this information is then

converted to quantities of baits required at centres and distances to be flown for fuel requirements. An exact timetable of arrivals and departures must be worked out, taking into consideration the direction of flights in relation to the sun (eastward flights in the early morning or westward flights in the late afternoon must be avoided if possible). Allowances are made for plane servicing and for resting the crew as the work is extremely hot and strenuous.

Fig. 4.—Rugged country near Mt. King in the Hamersley Ranges

This planning is followed by preparation involving chartering the aeroplane and conferences on the flights. Baits are ordered and arrangements made for deliveries. Owners of stations where bases are planned, and others, are contacted and informed of the part they are to play. Vermin Boards are requested to co-operate in organising all stations into district-wide poisoning drives to coincide with the aerial baiting.

The planning and preparations require months of detailed and careful work, but they are considered very necessary parts of the campaigns. The smoothness with which the operations have been conducted is the direct result of the preliminary work.

RESULTS OBTAINED

The three obvious methods of observing results are:—

(1) the number of carcasses seen;

(2) a decrease in the number of scalps handed in at local Vermin Boards;

(3) reports of decreases in sheep losses or in wild dog numbers.

Unfortunately, circumstances and conditions have proved quite unfavourable for complete reliance to be placed on any of these methods for the following reasons:—

(a) The baits were dropped, as far as possible, in areas too inaccessible or too remote for our ground men to operate over and therefore our main means of observation was limited. Endeavours were made to send our men in to baited localities wherever possible, but even this was curtailed by shortages of men.

(b) Seasonal conditions resulted in unusual movements of game and dogs. For instance, in 1949 early rains fell in the Ashburton while adjoining localities were dry. The subsequent influx of wild dogs was very heavy. Furthermore, over the years during which flights have been conducted, extremely dry and harsh conditions have prevailed in the north and inland of Australia, resulting in dogs being forced in from the inland desert and other regions. The 1952-53 "wet" has resulted in strips of heavy rain with other areas very dry.

(c) High prices for wool have made sheep losses more noticeable on all stations. Where formerly a few dead sheep were a matter of shillings, their loss is now measured in pounds. Even where dogs are known to be less in numbers and losses fewer, complaints have increased.

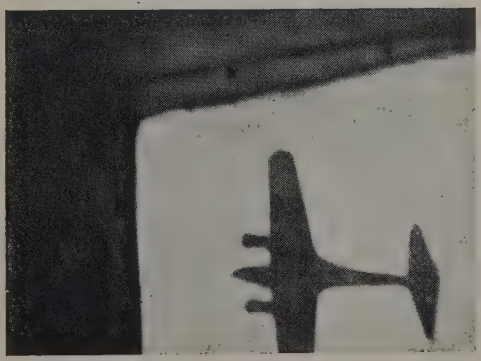

Fig. 5.—The shadow of the aircraft on the ground framed by the bait-dropping chute

Fig. 6.—Typical Tableland country behind Cherita Station, Roebourne district

However, the results obtained under these headings were:—

Campaign	Live Dogs Seen From Planes	Carcasses Found After Campaign
1948	42	300
1949	44	25
1950	42	27
1951 Sept.	4	38
,, Oct.	34	No observations made
1952 Sept.	3	11
,, Oct.	40	20
1953 May	21	26

The large number of carcasses found after the 1948 campaign was due to lack of experience which resulted in baits being dropped on station properties and near to settlements. In later campaigns the baits were dropped more accurately on the most inaccessible places. However, the following facts are of interest:—

A group of five dogs was seen during the 1949 campaign and five carcasses were found nearby shortly afterwards. During the October, 1952, campaign the following groups of dogs were seen from the plane:—Six at Lake Carnegie, three at Abydos Station and three at Perry Springs near Meekatharra. Subsequently four carcasses were found at Lake Carnegie, three at Abydos and three at Perry Springs near where the dogs were sighted. One cattle station which had not produced more than nine dog scalps in any year for some time, suddenly produced 60 scalps after a baiting flight had passed near its boundaries.

Thirty scalps were obtained from carcasses found near where baits were dropped along a river in the September, 1951, campaign in the Kimberleys. The finder (who was unaware of the baiting) reported that an outbreak of disease must have occurred among the dogs as very few were left alive.

Owing to shortages of men it was not possible to make any observations or follow up results in the October, 1951, campaign.

Decreases in Scalps Produced.

Numbers of scalps produced in the Vermin Districts mainly involved in the baiting were as follows:—

	1945 1946	1946 1947	1947 1948	1948 1949	1949 1950	1950 1951	1951 1952	1952 1953	Av.
Scalps from Vermin Boards most concerned	3,073	2,087	2,187	2,340	1,916	2,392	2,768	2,149	2,364
Scalps from other Vermin Boards in area	755	614	699	990	1,051	1,828	1,605	1,522	1,133
Totals for area	3,828	2,701	2,886	3,330	2,967	4,220	4,373	3,671	3,497

The "Vermin Boards most concerned" are Ashburton, Marble Bar, Meekatharra, Nullagine, Port Hedland, Roebourne-Tableland, Upper Gascoyne, Wiluna, and the "Totals for area" were taken from the statistical divisions of Northern Goldfields and North-West and the southern part of the Northern division.

The figures do not show any great reduction. However, there may be some significance in the fact that there has been a greater reduction in scalp numbers from the districts where aerial baiting was carried out than in neighbouring districts. The picture is clouded by other factors such as the very localised variations in seasonal conditions which are encountered in these areas. Also, the work of the Government doggers has been much better organised by having decentralised control. During the 12 months ended 30th June, 1953, the Government doggers obtained a record number of 1,000 of the 5,000 scalps produced in pastoral areas excluding the Kimberleys. The planning of the aerial baiting has been so closely integrated with the work of the men on the ground that it is difficult to assess the results separately.

One of the Department's doggers had been operating in the Hamersley Ranges for a number of years. Owing to the difficulties of penetrating these ranges, which are well known as a prolific breeding area, the dogger kept a line of traps around the foothills and his average catch was between 30 to 40 dogs a month. The ranges were heavily baited in each campaign and the average catch of this dogger dropped to nine a month. He raised objections to the aerial baiting and even went to the extent of saying that where baits were dropped in the vicinity of his traps he could not trap any dogs. He finally resigned. Stations in the baited areas reported decreases in dogs and foxes following the baiting.

Reports of Decreases in Sheep Losses or in Wild Dog Numbers Questionnaire.

A questionnaire was sent to various pastoralists on the baited areas asking for information, including decreases in sheep losses attributable to the baiting.

In the 20 replies received, all agreed that aerial baiting was a great advance in wild dog destruction methods. Only four stations reported big decreases in sheep killing attributable to the baiting, five more reported some decreases in dog and fox populations, and several mentioned the finding of dog carcasses. Most stated that seasonal conditions and influxes of dogs from inland districts prevented a true assessment of results.

Other Reports.

Immediately after the first aerial baiting in the West Kimberleys (September, 1951), three stations reported a complete cessation of dog attacks which had been continuous up until then. A period of three months elapsed before sheep killing recommenced.

The manager of another station in the West Kimberleys reported in June, 1953, that dogs were still not as numerous where baiting had been carried out in September, 1952, although they had not decreased elsewhere.

In July, 1953, a station-owner in the North-West stated that all the dogs and carcasses observed by him on or about his property during the past year had been adults. He considered that aerial baiting had destroyed the pups from the season's litters.

Fig. 7.—Portion of the coast north of Roebourne. Numbers of foxes were destroyed by baits dropped in the coastal sandhills

LOCAL AERIAL BAITING SCHEMES

A number of Vermin Boards and stations have conducted private aerial baiting projects. The West Kimberley, Meekatharra, Upper Gascoyne, Ashburton, Roebourne and Tableland, Wiluna, Port Hedland, Marble Bar, Nullagine, Laverton, Leonora, Menzies and Black Range Vermin Boards have all conducted or shared in campaigns. Difficulties in organisation and the costs of "dead" flying to and from the districts from the aeroplane's headquarters have deterred the Boards from continuing. Most

AERIAL BAITING.

DETAILS AND COSTS.

	1948. October.	1949. October.	1950. October.	1951. September.	1951. October.	1952. October-November.	1953. May-June.
				West Kimberley.	General.		
Period of campaign	9 days	11 days	17 days	2 days	19 days	19 days	11 days
Total miles flown	4,945 miles	6,926 miles	8,267 miles	1,476 miles	8,255 miles	9,587 miles	7,298 miles
Mileage over which baits distributed	3,370 miles	6,130 miles	7,555 miles	1,270 miles	7,544 miles	8,500 miles	6,690 miles
Number of baits distributed	285,000	455,000	590,000	130,000	479,000	507,000	350,000
Number of flying hours on baiting	28 hrs. 5 mins.	51 hrs. 5 mins.	64 hrs. 25 mins.	13 hrs. 5 mins.	62 hrs. 35 mins.	72 hrs. 10 mins.	55 hrs. 45 mins.
Expenditure—	£	£	£	£	£	£	£
Charter of aircraft	433	693	827	216	1,032	1,277	1,095
Cost of manufactured baits	880	1,476	2,632	689	2,491	2,852	1,969
Estimated cost of baits prepared by Departmental doggers, etc.	100	120	10	....	....	....	....
Freight and sundries	83	67	187	200	580	581	331
Wages (estimated)	60	80	100	10	100	150	100
Total	1,556	2,436	3,756	1,115	4,203	4,860	3,495
Less amount contributed by Vermin Boards, etc.	....	923	469	676	228	....	....
Cost to Department	£1,556	£1,513	£3,287	£439	£3,975	£4,860	£3,495
Cost to purchase and distribute each bait	1·3d.	1·28d.	1·52d.	2·05d.	2·1d.	2·3d.	2·39d.

Fig. 8.—Mt. Chaner on the Angelo River, Ashburton district

have expressed willingness to participate in an overall scheme organised by the Vermin Control Branch.

CONCLUSIONS

(a) Baiting is recognised as the most effective means of large-scale wild dog and dingo destruction. It is a matter of making baits which the dogs will eat, each containing sufficient poison to kill a dog and placing them where dogs will take them.

(b) It has been amply demonstrated in the campaigns conducted that:—

(i) Brisket fat baits gave the best results. Other materials were less attractive to the dogs.

(ii) The baits will kill dogs.

(iii) Trained personnel can and do drop baits where required, that dogs are taking them and are being killed.

(iv) Baits may be dropped from the air at less than 3d. each, while they cost 9d. to 2s. each to distribute from the ground.

(c) It is not considered that aerial baiting is as effective as ground baiting. Men operating on the ground have more time to observe tracks and signs and are able to place baits exactly where required.

(d) Where men are unobtainable or where areas are too inaccessible or too remote for men on the ground—and this includes many of the main breeding areas —aerial baiting affords an effective, and possibly the only, means of destroying wild dogs.

(e) It is preferable to use aerial baiting in close conjuntion with, and in extension of, ground baiting.

(f) The nature of the country, time of the year, trained personnel, careful planning and preparation are all important factors.

(g) The areas baited—the North-West, Wiluna, Eastern Goldfields and the Kimberleys —are ideally suited for aerial baiting. The northern and inland country which has been covered is open, landmarks are readily visible and identifiable, watering places are comparatively limited and are recognisable from the air, while the driest period follows immediately after the pupping season.

(h) The more southerly parts of the State do not seem as promising, but a trial baiting is to be conducted in these areas early in 1954.

(i) The time of the year selected for the main campaigns in the North-West, North and inland areas is when the country is at its driest just before the summer rains. Wild dogs concentrate near watering places and present good targets. Pups are on the move and are not sufficiently experienced to avoid baits.

(j) Indications are that much good may also be done by baiting in the mating season—May and June. The dogs move out of their normal hide-outs on to the plains and open country and are more vulnerable. Furthermore, destruction carried out at this time reduces the natural increase. Sufficient success was achieved in the 1953 experiment to warrant further trials.

(k) Target baiting is considered generally more suitable than dropping continuous streams of baits.

(l) Many Vermin Boards and station-owners have recognised aerial baiting as an effective means of wild dog control, but the organisation of campaigns is too big a task for most of them.

(m) Carefully-planned aerial baiting campaigns closely co-ordinated with ground baiting, should be continued as they have been proved successful.

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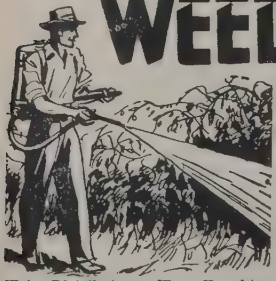

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HOW TO GET THE BEST RESULTS FROM CENTRIFUGAL PUMPS

By H. K. GIBSONE, Officer-in-Charge, Irrigation Branch

MANY thousands of centrifugal pumps are operating throughout the State, and from observations made while travelling around the country I find that, like the windmill, the pump is very frequently a neglected piece of equipment. The following hints may assist users to get to obtain good results from their pumps. Most of them are taken from a check list prepared by Mr. A. B. Lohr of the Engineering Department, Goulds Pumps Inc., New York.

The centrifugal pump is a sturdy and dependable piece of machinery which seldom fails to perform satisfactorily providing it is properly installed, adjusted, lubricated and operated within its rated capacity. The following pointers will help growers to get the best possible service from their pumps.

INSTALLATION

Where the pump is part of a permanent installation it should be properly set in on a concrete foundation and carefully levelled. When a flexible coupling is used, check the alignment with a feeler gauge and straight-edge.

In the case of portable units the pump unit should be blocked so that it is perfectly level and cannot creep. The alignment should be thoroughly checked each time the pump is operated.

All piping should be supported independently of the pump to relieve the machine of unnecessary strain. Suction piping should be as short and direct as possible, sloping upward from the supply to the pump. The suction lift should be not over 16ft. including the friction head. The suction piping should be as large as the pump suction and, if more than 20ft. long, a size larger, reducing at the pump with an eccentric reducer to avoid any air traps in the line.

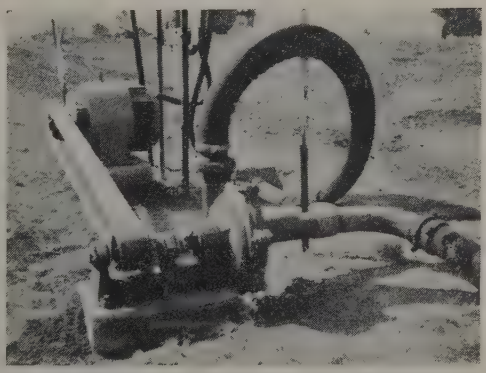
All piping joints must be airtight and the discharge piping should be at least as large as the pump discharge with as few fittings as are practicable.

The strainer should be installed at least 3ft. below the lowest level in the water supply, and should be inspected and cleaned frequently to ensure that it is free from foreign matter.

PRIMING

In the case of self-priming pumps the casing must be filled with water when started for the first time, after which they will prime themselves for future starts.

Those pumps which are not self-priming must be primed for the first start and then the prime can be held by a foot-valve in the suction line. Such pumps should be checked before each start as the check valve or stuffing-box may leak, causing the pump to loose its priming.



The centrifugal pump shown in the photograph is a simple single-stage pump of a popular type. It is shown being electrically driven by a flat belt, but would be more efficient if a V-belt drive was used. Note that that suction and delivery pipes are attached to reinforced rubber flexible hoses. The photograph also shows the solid concrete foundation which is essential for these pumps

Motor-driven pumps are usually primed by pouring or pumping water by hand into the priming opening in the casing until water comes out of the open vent valve on top of the casing.

Engine-driven pumps are sometimes equipped with an exhaust primer. When using, be sure that there is some water in the casing to lubricate the rotating parts during the priming period.

Never run the pump unless it is fully primed.

LUBRICATION

Motors with 'lubricated for life" bearings require no greasing, but other ball-bearing motors should be greased about every two or three months. Do not over-grease, and consult the motor manufacturers' instruction sheet if available.

The manufacturers' instructions for oiling and greasing should be faithfully adhered to where petrol or kerosene engines are used. The bearings of the pump should be lubricated according to the instruction sheet issued by the makers.

STUFFING-BOX

Where this feature has a mechanical seal it requires no adjustment and should be repaired only by factory-trained men.

In the case of packed stuffing-boxes, regular care is necessary and the gland should never be tightened so that there is no leakage or so that the box heats up in use. The stuffing-box should leak at least 40 to 60 drops per minute and the gland nuts should be adjusted evenly and only finger-tight.

Where a grease lubricator is used give the handle a turn or two after about every hundred hours' operation.

PROTECTION OF EQUIPMENT

Keep the pumping unit covered during wet weather. Disconnect all exposed electrical connections when not in use and instal suitable warning signs. In districts where heavy frosts are encountered, drain the pump and engine during freezing weather.

When starting the unit during winter or during long off-periods, drain pump and remove the stuffing-box packing, grease the shaft and dry the pump thoroughly.

TROUBLE CHECK LIST

1. **If not enough water is delivered.**
   - (a) Pump not completely primed.
   - (b) Speed too low.
   - (c) Suction lift too high.
   - (d) Discharge pressure too high.
   - (e) Impeller or suction pipe clogged.
   - (f) Air pockets in suction line.
   - (g) Stuffing-box packing worn or water seal plugged, allowing air to leak into the casing.
   - (h) Air leaks into suction line.
   - (i) Check valve installed incorrectly.
   - (j) Water supply too low.
   - (k) Strainer not submerged deeply enough.
   - (l) Impeller damaged.
   - (m) Casing gaskets defective.

2. **Not enough Pressure.**
   - (a) Speed too low.
   - (b) Air in water.
   - (c) Impeller damaged.
   - (d) Casing gaskets defective.

3. **Pump works for a while and then quits.**
   - (a) Air leak in suction line.
   - (b) Stuffing-box packing worn.
   - (c) Air pocket in suction line.
   - (d) Suction lift too high.

4. **Pump leaks excessively at stuffing-box.**
   - (a) Packing is worn or not properly lubricated.
   - (b) Packing is not properly inserted or run in.
   - (c) Shaft or shaft sleeve is scored.

As a final note, I would like to remind users to make sure that the pump is rotating in the right direction as indicated by the arrow on the casing. Many beginner's troubles have stemmed from attempts to run the pump in the reverse direction to that intended by the maker.

INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist

VINE LEAF BLISTER MITE

(Vine Erinose) *Eriophyes vitis* (Pgst.)

THE vine leaf blister mite has been recorded in Western Australia for a number of years, but in the last two seasons it has become very common on backyard vines in the metropolitan area and has appeared in some commercial vineyards. This mite is of European origin, but it has now become established in the United States of America and various other grape-growing countries. It is believed to have reached Australia from America some time during the decade 1910 to 1920 (Froggatt, 1920) and since then it has gradually spread over the continent.

DESCRIPTION AND LIFE HISTORY

The mites are very small and not visible to the naked eye. Under the microscope they appear whitish in colour and quite unlike the better known eight-legged garden mites in structure. Like all mites belonging to this particular family (Eriophyidae), they are elongate in form with only two pairs of legs. The feeding of the mites on the under-surfaces of the vine leaves produces yellowish areas which soon become raised into blister-like swellings, the cavities on the under-side being filled with felt-like patches of hairs.

These patches are often mistaken by inexperienced growers for some type of fungal disease. The economic importance of the blister mite or the associated erinose (hairy felting) in this State cannot yet be judged, but in other States it has proved of minor importance, especially where routine treatments with sulphur are applied for fungal diseases (Coombe, 1950) (Anon, 1950) Queensland Agric. & Past. Hand Bk., 1951).

Fig. 1.—The Vine Leaf Blister Mite, greatly magnified. Inset—The underside of the foot —(Agricultural Gazette of N.S.W.)

Breeding continues during the spring, summer and early autumn, so that several generations of mites may develop. Before the winter many migrate under the bud scales and there they remain protected until

it is time to attack the next season's spring growth.

The blister mite should not be confused with the grape rust mite *(Calepitrimerus vitis)* (Nal.) which is prevalent in this State but produces no blister-like formations. The feeding is done mainly on the upper surfaces of the leaves and results in general russetting of the foliage but appears to have little effect upon the health of the vine or the fruit yield.

CONTROL

The general recommendation for dealing with both the mites referred to in this article is the use of lime sulphur spray late in the winter but just before the buds begin to swell. The dilution recommended is lime-sulphur 1 gallon to 10 gallons of water (1 pint to 1¼ gallons). After the vines have broken into leaf, control becomes more difficult but dusting with flowers of sulphur when the shoots are a few inches long has proved helpful. Lime-sulphur at 1 gallon to 70 gallons of water and colloidal sulphur 1 lb. to 50 gallons of water have also proved useful in the early stages of attack. Sulphur treatments should not be applied during heat waves as foliage burning may result.

No carefully planned trials have been carried out with the new organic phosphates* such as H.E.T.P. (sold locally as "Hexone"), Parathion ("Phosphone", "Folidol") but these are powerful miticides and may be useful for spring treatments.

Experience in this State has been insufficient to determine varietal susceptibility under local conditions, but the muscats are generally regarded as a particularly susceptible group and currants and sultanas are relatively resistant.

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Coombe, B. G., 1950, Journ. Dept. Agric. S. Aust., Vol. LIII, No. 7, p. 285.

Froggatt, W. W., 1920, Agric. Gaz., N.S.W., Vol. 31, Aug., 1920.

Queensland Agricultural and Pastoral Handbook 1951, Vol. III, p. 75.

* *Warning.*—Organic phosphates are highly toxic to humans and care should be taken not to inhale the spray mist or allow the concentrate to splash on the bare skin. Should this occur, it should be washed off immediately with soap and water.

Fig. 2.—Results of infestation by vine leaf blister mite. Left—Felt-like masses of hairs on under-surface of vine leaf. Right—Blistered appearance of upper surface

PLANT DISEASES

FURTHER EXPERIMENTS ON THE CONTROL OF EARLY BLIGHT OR TARGET SPOT OF POTATOES

By W. P. CASS SMITH, Government Plant Pathologist; M. HARDIE, Vegetable Instructor; B. N. LOWE,* Vegetable Instructor

THE effective control of Potato Early Blight or Target Spot by the use of Zineb fungicide (used in the proprietary form Dithane Z.78) has previously been reported in this Journal. It was shown in preliminary spray trials that the foliage blight caused by this disease is very destructive, and by the application of four Dithane sprays yields were increased in the order of 30 per cent., equivalent to approximately four tons per acre. Further experiments have now been conducted and the results indicate that even two applications of Dithane spray may, under conditions of severe blight attack, promote worthwhile higher yields.

Early blight or target spot caused by the fungus *Alternaria solani*, is a destructive disease of potatoes which in Western Australia is most prevalent in crops harvested in early summer and autumn. The disease attacks the foliage and as a result the tops are killed prematurely with consequent reduction in yield. Also, when crops are dug, contact between diseased tops and tubers may in certain circumstances lead to a tuber rot which develops in storage and is commonly referred to by growers as "storage disease." (For a fuller account of the symptoms and effects of the disease, see Leaflet No. 2056.)

Hitherto, early blight of potatoes has generally been recognised as a difficult disease to control, for the older copper fungicides such as Bordeaux mixture proved unsatisfactory. In 1952 however when spray trials with recently secured new fungicides were conducted, very encouraging results were obtained with Dithane Z-78, a proprietary Zineb type spray (see Leaflet No. 2056). Subsequently this material was also found to be very effective for tomato early blight caused by the same fungus. (See Leaflets Nos. 2028 and 2105.)

The 1952 spray trials referred to were conducted in potato crops harvested in November-December, and four sprays of Dithane Z-78 were applied. The experiments now reported were conducted in the summer crop and were designed to compare the effects of two and four applications of Zineb spray. In Western Australia, the summer crop is planted in December-January, and is grown in drained swamps, or on land irrigated by furrow or sprinklers. The crop is harvested in autumn during April and May. Warm humid weather conditions ideal for rapid disease development

* Resigned from the position of Vegetable Instructor in August, 1953.

Fig. 1.—The photograph shows a small demonstration plot sprayed with Zineb in a potato crop grown by Mr. V. Morabito at Harvey. Note that the unsprayed plants surrounding the plot have been defoliated by early blight while the plants sprayed with Zineb have retained their foliage.

are commonly experienced as crops approach maturity, and in consequence the tops often become badly blighted.

Losses from tuber rot or "storage disease" are often very serious in the autumn harvested crop. This is because early digging which is often necessary to avoid flooding after heavy rains, facilitates tuber infection, and also because storage of the potatoes on the farm for several weeks before sale is necessitated by customary marketing practice.

Control of early blight attack on the foliage with consequent reduction in the amount of tuber rot is therefore of great importance in the profitable production of the summer crop.

Details of 1953 Spray Trials for Control of Early Blight.

Two experiments similar in design were conducted on the properties of (1) Messrs. T. H. Rose and Sons, Roelands; and (2) Mr. T. Talbot, Brunswick Junction.

A randomised block layout was used with six replications of four treatments (see table). Plots consisted of double rows each 40 links long with 10-link buffer (unsprayed) areas between each plot.

Spray Treatments.	Strength.	Average Plot Yield, 1st Grade Tubers.
(1) Control-unsprayed	....	49·8 lb.
(2) Copper Oxychloride—4 applications	3½ lb. : 100 gals.	51·3 lb.
(3) Zineb (Dithane Z–78)—2 applications	2 lb. : 100 gals.	61·8 lb.
(4) Zineb (Dithane Z–78)—4 applications	2 lb. : 100 gals.	63·8 lb.

Least Difference for Significance at 99 : 1 level = 8·3 lb.
Least Difference for Significance at 19 : 1 level = 6·0 lb.

Unfortunately the experiment on Mr. Talbot's property was finally abandoned, for soil salinity developed and adversely affected crop growth. At Mr. Rose's property the first sprays were applied on 25th March, 1953, just before the tops met together in the rows, and when early blight was present in trace amounts only. Subsequent sprays were applied as follows:—

2nd spray, 2/4/53
3rd spray, 13/4/53
4th spray, 23/4/53

Results.

As in previous spray trials, Zineb was again the only fungicide to give effective control of early blight and resultant higher yields. Under the conditions of this ex-

periment, two applications of Zineb spray were as effective as four, and gave a yield approximately 25 per cent. higher than the control (unsprayed) plots (see table). However, from observations made during the progress of the experiment it seems probable that the plots sprayed four times with Zineb would have given a much higher yield had it not been for the occurrence of late frosts, and potato moth which finally infested these plots, as they contained the only green foliage remaining in the paddock. It is noteworthy that the yield of plots sprayed four times with a standard copper spray was no better than that of the unsprayed plots.

In addition to the above experiments, plots were established in the Manjimup and Harvey districts to demonstrate to growers the value of Zineb for controlling potato early blight. In most cases spectacular results were obtained (see Figs. 1 and 2).

Recommendations for Potato Early Blight Control.

It is understood that the proprietary Zineb spray Dithane Z78 will shortly be available in commercial quantities in Western Australia, and will retail at approximately 15s. per lb. On this assumption, the following tentative recommendations for early blight control are made:—

1. While the disease is still present in trace amounts only and before the tops in adjacent rows meet, apply a Dithane spray at a concentration of 2 lb. in 100 gallons of water (or an equivalent concentration of other Zineb proprietaries which may become available). Thorough coverage particularly of the bottom foliage is necessary at this stage, and a minimum of 200 gallons of spray per acre will probably be required.

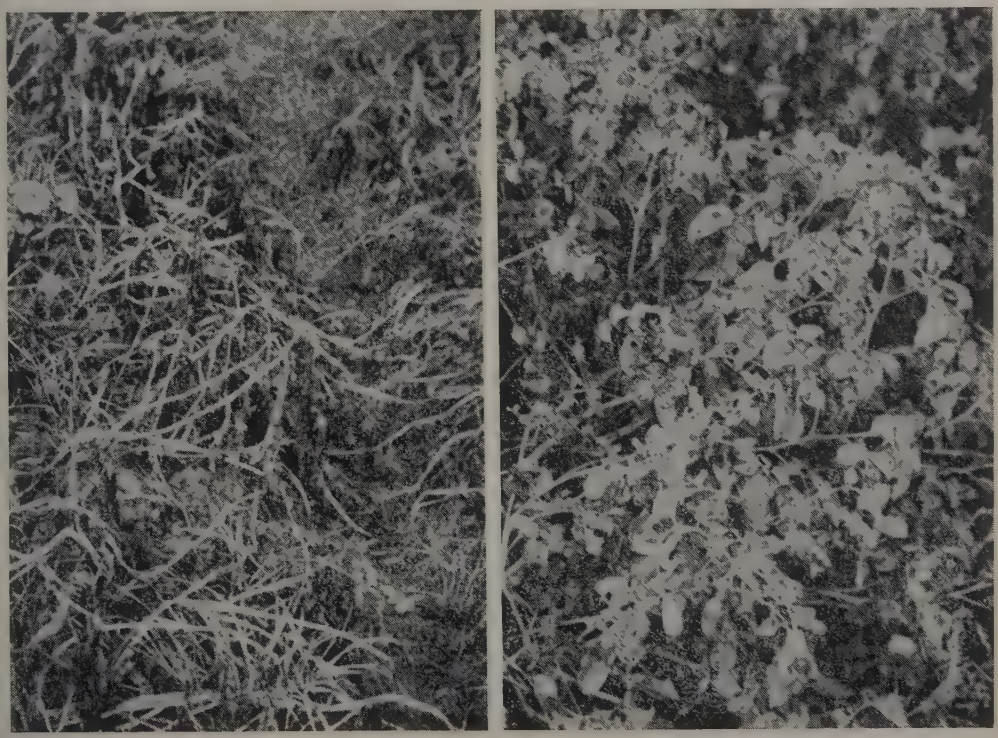

Fig. 2.—A closer view of unsprayed potato plants in Mr. V. Morabito's crop (left) compared with plants sprayed with Zineb (right).

2. About 10-14 days later, apply a second spray at the same concentration, using approximately 300 gallons per acre.
3. Zineb type sprays are compatible with D.D.T. and most other insecticides, so that a combined spray for the dual control of early blight and potato moth, etc., may be used.
4. Where it is proposed to use a medium volume boom spray outfit, the amounts of Dithane applied per acre should be similar to those recommended in (1) and (2) above. Some experimentation will be required to determine the most suitable spray nozzles, and the minimum gallonage of spray per acre to secure adequate coverage. It is suggested that a minimum of 50 gallons per acre will probably be needed.
5. It is possible that some alteration in present planting methods may be necessary to facilitate the mechanisation of potato spraying operations.

Zineb containing dusts have not yet been tested here, but if they become available and are considered more convenient they are worthy of trial.

Acknowledgments.

Grateful acknowledgment is made to those growers who placed land and facilities at the disposal of the Agricultural Department for the conducting of these experiments and demonstrations. Thanks are also due to the W.A. Potato Marketing Board for its assistance and continued interest, and to Messrs. J. O'Neill and D. C. Fouracres, who helped to apply the sprays.

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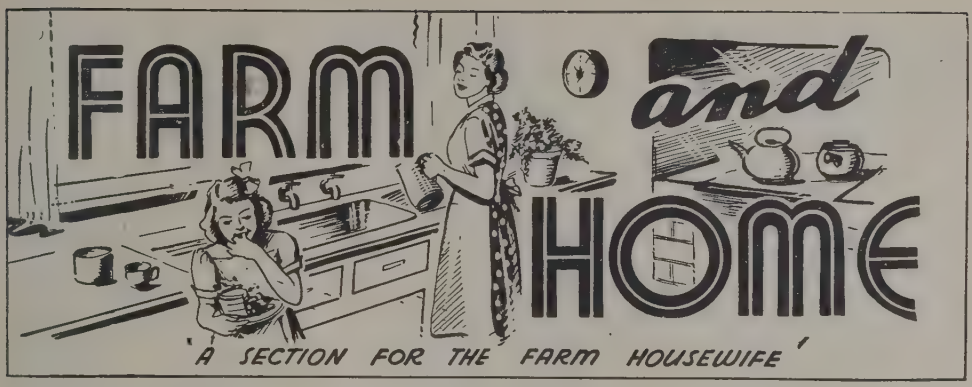


Avoiding Pastry "Left-overs"

By HELEN M. GLOSTER.

(With acknowledgments to Miss F. N. Gray, Home Science Instructress at Perth Modern School, who carried out the practical work and supplied much of the information given in this article.)

WHEN making pastry, the housewife is often at a loss to know exactly how much pastry to make for lining a plate or covering a pie and at the same time to avoid those annoying "left over" pieces.

The quantities and measurements given here have been tested with great attention to detail.

Weights given for pastry, refer to the quantities of flour used to make the pastry.

Little Tarts in Patty Tins.

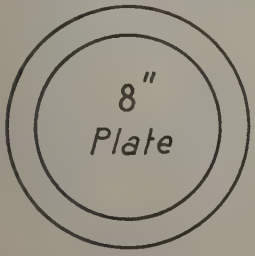
Two oz. flour will make six small tartlets.

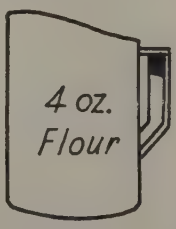
Plate Tart.

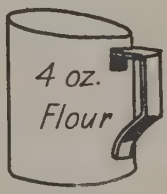
Measure the diameter of the plate you are going to use.

Allow ½ oz. pastry for each inch of diameter.

(A plate measuring eight inches in diameter will require 4 oz. pastry.)







Pies in Pie-dishes.

Measure the **length** of the pie-dish, rim to rim and allow ½ oz. pastry for each inch.

(An eight-inch pie-dish will require 4 oz. pastry.)

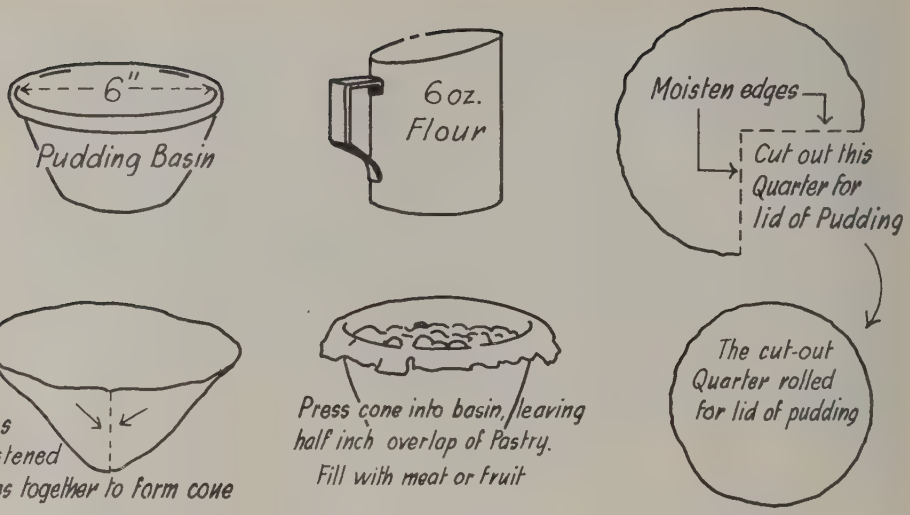
FRUIT FOR THE PIE

Rhubarb Pie.

One lb. rhubarb requires ½ cup of sugar and half an inch of water in the pie-dish after the rhubarb and sugar have been added.

Apple Pie or Apple Suet Pudding.

One lb. of apples requires ½ cup sugar and sufficient water to reach half way up the apples.



Roll spare pastry into a disc to fit inside basin. Lay disc on pudding contents, moisten edges and press overlapping pastry down on top of disc.

CORNISH PASTIES

Six ounces of pastry will make three pasties when cutting out pasties with a saucer measuring six inches in diameter. The lid of a six-inch aluminium saucepan makes an excellent cutter and will serve for measuring and cutting.

BOILED SUET PUDDING

(In basin with fruit or meat filling)

Six ounces of flour is the correct amount for a pudding basin measuring six inches in diameter.

To line the basin economically roll the paste out into a **circle** two inches larger all round than the basin to be used.

Keep the paste in a round shape. Cut a wedge (a quarter of the circle) from the paste from the centre outwards and keep this to make the lid. Damp the edges and join. You will have a cup-shaped piece of dough which will line the basin without puckering. Do not forget to grease the basin.

Press the paste carefully into the basin allowing it to come ½in. beyond the rim of the basin. Put the filling into the basin. Take the wedge of paste, damp the three points of the triangle and turn them in towards the centre to make a round. Roll out to fit over the top of pudding to the **inside** edge of the basin.

Damp the edges and fit on to the overhanging edges of the lining pastry.

Jams and Jellies for Exhibition

By HELEN M. GLOSTER.

MOST housewives make excellent jams and jellies, but when it comes to exhibiting they find there are many finer points which have to be considered. Taken separately these points are relatively unimportant but taken collectively they are sufficient to prevent an exhibitor from gaining an award.

A wise exhibitor will think about her exhibits well in advance, possibly twelve months ahead or at least early in the soft fruit season.

The first thing to do is to go through your collection of empty bottles and jam jars and make a selection of small, attractive identical jam jars with matching screw top lids. Screw top jars are desirable from the judge's point of view as all jams must be inspected for "jell" and tasted during the judging. Lids may be replaced after judging. Empty one-pound honey jars are suitable and fulfil requirements. There is nothing arbitrary about this, however, and any jars of similar size are suitable. Large jam jars are quite unnecessary. Similarly, matching identical preserving jars should also be set on one side for bottled fruits, if these are to be exhibited.

Each time you make a fresh "pan" of jam one of these selected jars should be filled very carefully, covered, labelled and put on one side. When Show Day draws near you will be able to make a really representative selection from the best preserves in your pantry!

When making your selection, pick out the very best your pantry has to offer.

When a collection is asked for see that your selection is really varied. Do not put in all berry jams or all stone fruit. Vary the jams in this way if a collection of three bottles is required:

One berry jam.

One stone fruit jam.

One mixed fruit jam (i.e., melon and lemon or melon and ginger).

A weakness in collections is to use a common foundation, i.e., melon and just vary the flavourings with lemon, ginger, Cape gooseberry or pineapple. Variety as suggested earlier gives a greater contrast in both flavour and appearance. If you

start your collection 12 months ahead of the show you will have a good variety from which to choose.

Contrast in appearance may be gained by exhibiting jams of different colour. Apricot, mulberry and melon, or quince, plum, and fig will give three good contrasting jars of jam.

The method of preparation should also show good contrast. Berry fruits (strawberries, Cape gooseberries, grapes, blackberries) are usually pricked and left whole.

Stone fruits and figs are halved or quartered according to size. These will give you a variety of jam as distinct from berry fruits.

Pears, melons or quinces are cut into neat dice. Here is your third variety.

Citrus fruits for marmalade have the rind shredded and the pulp cut up or diced. These usually form a class of their own, so we have four distinct methods of preparing fruit which will help us to obtain the variety which the judge appreciates.

JAM MAKING

Most fruits contain a jellying property called "pectin". Pectin is present in fruit when it is ripening but is not present in over-ripe fruit. Pectin is most abundant in fruit just before it ripens, therefore select fruit which is just under-ripe for best results when making jams and jellies.

Some fruits are rich in pectin, other fruits contain very little. Citrus fruits, apples, quinces are rich in pectin, therefore considerable quantities of water are added to these fruits when making jams and jellies to obtain the right consistency.

Strawberries, mulberries are almost entirely lacking in pectin. When making strawberry jam a little lemon juice is added to make the jam "jell". Apples or plums are added to mulberries for the same reason.

A fruit with a strong well-defined flavour, the Cape gooseberry, for instance, is often combined with melon, a fruit which on its own is rather tasteless. The combined result is a jam of very delicate flavour. Cape gooseberries if purchased are expensive, but melons are cheap, so the reduced cost of this mixed jam is a consideration.

Melons, as mentioned already are very cheap and flavourless. However, delicious melon jams may be made by flavouring them with ginger, lemon, orange, pineapple, Cape gooseberries or other fruits of well-defined flavour.

Sugar is the preservative in jam and jelly making. The quantity varies between $\frac{1}{2}$ and $\frac{3}{4}$ lb. of sugar to each lb. of fruit according to the fruit used. Grapes and figs require less sugar than plums and apricots.

A wide shallow pan is best for jam making. This allows for rapid evaporation of moisture. An enamel pan is considered the best. Iron should never be used. I find aluminium pans are quite satisfactory. Use a wooden spoon for stirring.

Choose the **best quality** fruit. The bloom should be rubbed off the fruit with a damp cloth. Most fruits require thorough **washing and drying** on account of insecticidal or fungicidal sprays used by orchardists which may leave residues on the fruit.

Stone fruits should be cut in halves or quarters and the stones removed.

Berry fruits should be pricked. This prevents skins bursting, prevents fruit from losing its shape and hastens the flow of fruit juices. In the case of grape jam it allows for the escape of seeds, which may be skimmed from the surface of the jam with a strainer, as they rise to the surface.

Firm fruits, such as quinces and melons, should be diced carefully for good appearance. The size of the dice is a matter of individual taste. The main point is that diced fruit should be even in size.

The addition of water to jams makes a clearer, more sparkling, jam and helps to prevent burning and sticking.

Fruit should be cooked **very slowly** until tender **before** the sugar is added. On adding sugar, jam should be stirred until sugar is dissolved. Jam should then be boiled quickly and stirred regularly until

it reaches the jell point. Scum should be removed during cooking and the jam should be removed from the fire immediately the jell point is reached.

All jars should be washed, rinsed and dried by heating. A tea-towel should not be used. Jars dried by heating are sterile.

Jam should be poured into **hot** jars, but it is advisable to allow the jam to cool off a little before bottling. This prevents the fruit from rising in the jars and, in the case of marmalade, gives a more even distribution of the shredded peel.

Jars should be **filled to the brim.** There are several methods of covering jam, but I favour this method:—

Allow the jam to get **quite cold.** If jam is cooked to "jell" point a "skin" sets on the top, the jam contracts as it cools and the skin subsides in the middle slightly, making a natural seal to the jam.

Cover with paper when **quite cold.** These papers may be removed and screw tops put on jars just before the show, or screw tops may be put on top of jar over paper cover.

Cut rounds of greaseproof paper ½in. larger all round than rim of the bottle. Make a few slits around edges of the paper so that they can overlap when pasted down.

Covering jam while hot by this method is asking for trouble. The seal has not formed, steam is given off and moisture condenses between the jam and the paper cover, so that mould is almost certain to form. Mould will also form on any jam without the "jell seal", i.e., jams with insufficient pectin content or undercooked jams.

Label your jams with trim, neat labels, placed near the top of the jar. See that writing or printing is clear and neat. The date on which the jam was made should appear on the label.

Store all jams in a **cool place.**

MAKING FRUIT JELLY

Again slightly under-ripe fruit gives best results. To obtain a clear jelly, fruit, utensils, straining cloth or jelly bag must be scrupulously clean. Sugar must be free from all specks. For straining, a chair may be inverted on a table and a good, clean tea-towel, which has been boiled, is tied by the four corners to the legs. A basin is placed underneath and plenty of boiling water poured through the tea-towel to free it from fluff, dust particles or other impurities. A flannel bag may be used if preferred.

Fruit for jelly is cut up **roughly,** skins, seeds and pips included.

Fruit is well covered with water and **cooked gently until soft**—usually about one hour. Fruit should be **stirred occasionally.** Pour fruit and liquid **gently** into straining cloth. Allow to drip through to basin underneath. On no account squeeze or touch the cloth, as this will cloud the jelly.

Measure the strained liquid and place in a **clean** pan. Heat the liquid, then add 1 cup of sugar to each cup of liquid. Boil quickly until jell point is reached. This is usually about 20 minutes.

All scum should be carefully removed as it rises. Turn liquid into heated jars. Cover as for jam when quite cold.

MAKING MARMALADE

1. Wash and dry the fruit.
2. Peel fruit **very thinly.**
3. With a clean pair of scissors shred the rind.
4. Cover with water and leave overnight.
5. Remove seeds from fruit, cut fruit into slices, then dice if desired.
6. Cover with water, leave overnight. If lemons are used, pith should be removed, as this makes marmalade cloudy. Grape fruit pith will not cloud marmalade.
7. Next day boil skins and pulp separately until tender and soft. Stand another 24 hours.
8. Measure and put two mixtures together. Allow 1 cup sugar to each cup of mixed fruit and liquid.
9. Boil rapidly until jell point is reached.

TO TEST JAM OR JELLY FOR JELL POINT

Test one.

1. Place a little jam on a **cold** saucer, allow jam to cool.
2. Tilt saucer. If "jell point" is reached surface of jam will go into wrinkles.

Test two.

Stir jam with wooden spoon. Lift spoon and turn in hand a little allowing jam to drop from it. If jell point is reached drops will run together to form flakes before falling from spoon.

TO DETERMINE PECTIN CONTENT OF FRUIT

Simmer fruit with water until soft. (This may be the fruit you are actually making into jam.)

Put one teaspoon of juice in a basin, add three teaspoons of methylated spirits. Shake gently, leave one minute. If a firm clot forms, the pectin content is good.

If fruit is low in pectin mix with fruit rich in it. A teaspoon of lemon juice to each pound of fruit is often all that is necessary.

Home Made Pectin Extract (to add to fruits low in pectin):

3 lb. sour apples (windfalls).

Wash apples, cut up roughly. Cover with water (1 to 1½ pints).

Simmer gently until pulped (1 to 1½ hours).

Strain through jelly bag.

Repeat process by adding more water, pulp the mixture.

Stew well, strain.

Mix two liquids together.

POINTS FOR EXHIBITORS

1. Jars should be in matching sets.
2. Jars must be scrupulously clean, neatly covered and labelled.
3. Jam collections should be varied in regard to
   (a) method of fruit preparation;
   (b) flavour;
   (c) colour.
4. Jams should be of good well-defined flavours.
5. Texture should be good, and jam not too thick.
6. A jell seal on top of jam is essential. No sign of moisture on top.
7. Jam should be clear and sparkling in colour.
8. No sign of sugar crystals on top of jam.

TRY THESE RECIPES

Strawberry Jam

To each pound of strawberries, 1 teaspoon lemon juice, ¾ lb. sugar.

Method:

1. Remove stalks of strawberries, wash well but do not dry.
2. Place fruit in pan and prick with fork.
3. Add lemon juice, **simmer gently** until soft.
4. Add sugar, stir until dissolved.
5. Boil quickly until jell point is reached.

Melon and Cape Gooseberry

6 lb. melon (weighed after cutting).

6 lb. Cape gooseberries (weighed after shelling).

9 lb. sugar.

1 pint water.

Method:

1. Cut the melon into neat dice about the size of a Cape gooseberry.
2. Shell and prick Cape gooseberries.
3. Leave fruit overnight, covered with 1 lb. of measured sugar. This helps to commence flow of fruit juices.
4. Next morning add water to fruit and simmer gently until fruit is soft.
5. Add remainder of sugar, stir until dissolved.
6. Boil rapidly until jell point is reached.

N.B.—If preferred, the juice of one lemon may be added to make jam less sweet. An extra cup of water should also be added.

Quince Jam

1. Be careful in selection of quinces. They must not be over-ripe.
2. Wash quinces, dry and place whole in preserving pan. Cover with water.
3. Simmer until tender.
4. Remove quinces from liquid, cool down, then peel and core.
5. Return peelings and cores to the water and cook another half hour then strain. Discard peelings and cores.
6. Dice the fruit, return to liquid and weigh.
7. To each lb. of fruit add 1 lb. of sugar.
8. Stir over fire until sugar is dissolved.
9. Boil quickly until "jell point" is reached.

This recipe has an advantage over those recipes whereby fruit is prepared when raw. Time is saved by softening fruit by boiling, before peeling and dicing.

Fig Jam

12 lb. figs.
8 lb. sugar.
2 lemons.

Method:

1. Wash and dry figs.
2. Cut up roughly, into four or smaller, removing stalks.
3. Cover with 2 lb. sugar. Leave overnight.
4. Cut lemons in half, squeeze juice and add with halved lemons.
5. Simmer gently until tender.
6. Add sugar, stir until dissolved. Boil rapidly until jell point is reached.

Remove halved lemon skins. This jam will not set without lemon.

N.B.—Four ounces finely chopped preserved ginger may also be added.

Grape Jam

6 lb. grapes.
3 lb. sugar.
Juice 2 lemons.

Method:

1. Remove grapes from bunches, wash well.
2. Put grapes in preserving pan, prick or press well, to allow escape of juices and seeds.
3. Add lemon juice, simmer until tender.
4. Add sugar, stir until dissolved.
5. Boil quickly until jell point is reached.
6. Using a strainer, skim off seeds as they rise (liquid will run back into pan).

N.B.—This jam will not set without lemon juice.

SCISSORS IN THE KITCHEN

A PAIR of scissors can be a particularly useful feature of the kitchen equipment, and it is worth while to buy a cheap pair and hang them in a handy spot.

When making marmalade, the scissors will be found much more effective than a knife in shredding the peel of oranges, lemons and grapefruit. Scald the scissors then snip away at the peel and you will find that really fine shreds may be obtained without difficulty.

Use your kitchen scissors to cut up parsley for sauces, etc. Pick up a bunch of parsley in the left hand and snip with the scissors.

Gather up the parsley a second time if necessary and cut a second time to get it finely chopped. Mint for mint sauce can be cut similarly.

When cubing steak for a stew, use the scissors again. Scissors are just the thing for removing rind from bacon rashers too.

—H.M.G.

Elliotts

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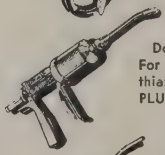

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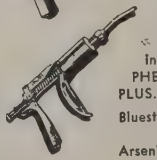

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THE BUDDING OF ROSES

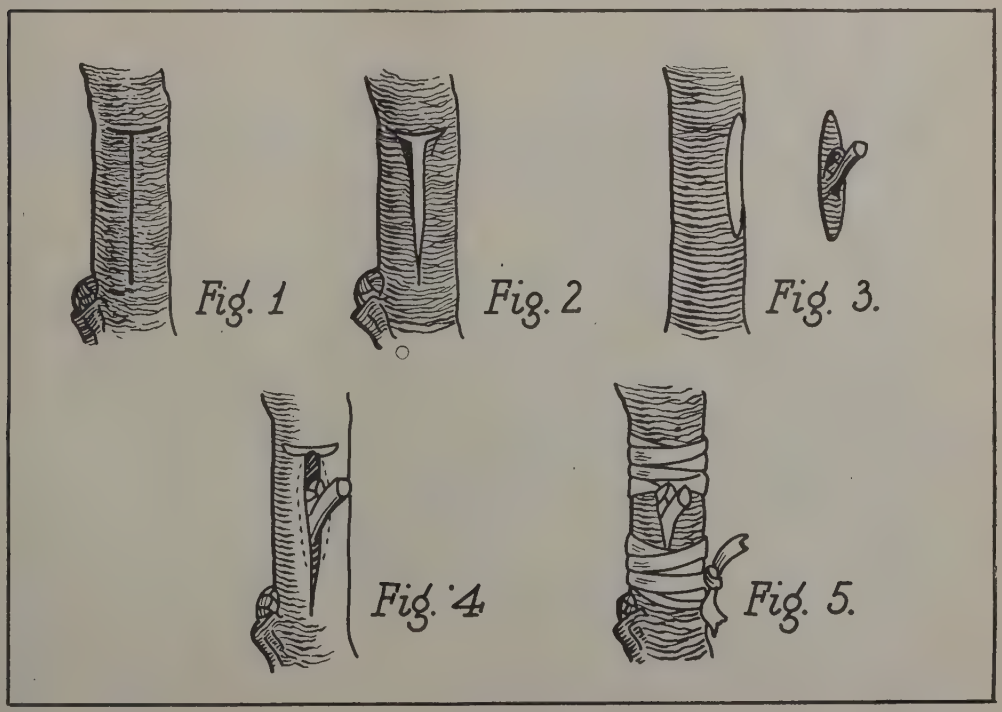
By C. C. HILLARY.

I DO not know of any phase of rose culture that holds more interest for the amateur than the raising of rose plants by the method known as budding. To grow one's own stocks, bud them, and then watch the young roses grow to maturity provides an interest so absorbing that few can resist it.

Fortunately, budding is quite a simple operation and there is no reason why anyone who cares to observe a few simple rules should not be successful.

Perhaps the most important of these rules relates to the flow of sap, both in the stocks to be budded and the bushes from which the buds are to be taken. This must be free and plentiful and, unless it is, the operation is not likely to be successful. To ensure that the sap-flow is plentiful, both stocks and rose bushes should be very heavily watered on two or three successive days immediately before the budding is carried out.

Another point worth remembering is that budding is always more successful when done on hot days than cold ones. The reason for this is that the sap-flow is greater on hot days, because on hot days transpiration through the foliage is greater, and in order to make good the loss of moisture, the flow of sap through the plant is considerably increased.



In this State, the best stock for roses is Fortuneana. It grows quickly, vigorously and almost continuously, is very suitable for all types of soil, especially those of a sandy nature, and is a compatible stock for all kinds of hybrid tea and floribunda roses. No other stock is so well suited to Western Australian conditions and nobody should waste money buying roses budded on other stocks.

Fortuneana stocks required for budding should be planted at the beginning of June. The "strike" is invariably higher with cuttings planted then than it is with those planted later in the year. June-planted cuttings should be well enough grown for budding in November and December. If they do not appear to be making satisfactory growth by the middle of October, they should be helped along with an application of fertiliser, such as potato manure (E).

Having established the stocks, the most important thing then is the selection of suitable buds (scions) for budding. These should be taken only from plants which are typical of the variety and have given a good performance in the garden. Buds should never be taken from a rose bush which has not grown well, nor from one that seems prone to disease. In my own garden, it is customary to mark those bushes which consistently produce good flowers and these only are used for providing bud-wood.

The most suitable shoots from which the buds should be taken are those of average size that flowered a day or so prior to being required for budding. The best buds are those situated in the middle of the shoots. Those near the top of the shoot are nearly always too far advanced, while those at the base are usually so dormant that they take an exceptionally long time to break into growth—some never do. A test for the right condition at which to take the buds is when the thorns snap off easily, leaving a damp green patch underneath.

It is important that the buds should be kept fresh and plump from the time the shoot is cut from the rose bush until the buds are removed and inserted in the stocks. The leaves should be cut off immediately, leaving only the stem of each leaf, attached to the bud wood. These stems serve as handles when the buds are being inserted in the stocks. If the buds are not to be used immediately, then the shoot or bud-wood as it is usually called, should have its lower end placed in a tin of water.

Budding can be done with any sharp pocket knife, though a proper budding knife is better for the purpose. Budding knives have handles made with tapered ends so that they can be used for lifting the bark of the T shaped cut made on the stock.

The budding of the stocks should be done as close to the ground as possible. It will make the work easier if a little of the soil is scraped away from around the stock. To ensure a clean stock, it should be wiped with a piece of damp flannel before being budded.

The first step in the actual budding of roses is to make a T shaped cut in the bark of the stock. Do not cut deeply but merely through the bark. Make the cross cut first and then downward cut (see Figure 1). Then with the handle of the budding knife prise open the flaps of bark formed on each side of the T. If the bark does not lift easily, the stock is not ready for budding. (See Figure 2.)

The next step is to remove the bud from the bud-wood and this is done by making a slanting cut, starting about half an inch below the bud and coming out about half an inch above it (see Figure 3). The thin sliver of wood at the back of the bud should then be removed. This is best done by holding the bud by the leaf stalk in one hand and prising off the wood with the blade of the budding knife and the asistance of a finger of the other hand.

The bud is now ready for placing in the stock. With the handle of the budding knife, prise open the bark of the T cut and, grasping the bud by the small piece of leaf stalk, slip it in from the top, pushing it down as far as it will go (see Figure 4). Cut off any portion of the shield remaining above the T incision and then tie the bud in with raffia. (See Figure 5.) The raffia should be soaked in water and then wrung out before being used. Commence winding the raffia from the bottom; do not cover the actual bud, and finish with an ordinary half-hitch at the top.

You can tell within a fortnight if the buds have taken. If they remain greenish in colour, and the small piece of leaf stalk falls away easily when touched, the budding is successful. Some three weeks later, it is advisable to loosen the raffia ties by undoing them and tying them on loosely again.

Some buds will grow away within two, three or four weeks; others will remain dormant until the following spring when the tops of the stocks should be cut off about one inch above the bud. If the growth made from the bud is vigorous and heavy, it is advisable to secure it to a light stake to prevent it being blown out of the stock by the wind. It must be remembered that the union of the bud with the stock is not very strong during the early days of growth, but it strengthens rapidly.

FREE SERVICE TO FARMERS

Do you know that the Department of Agriculture provides a comprehensive service of advice and technical assistance to farmers, free of charge?

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These officers are there to help you and will make personal visits to your property to assist with on-the-spot advice. In addition, they will, where necessary, arrange for the services of specialist officers—all without cost to you.

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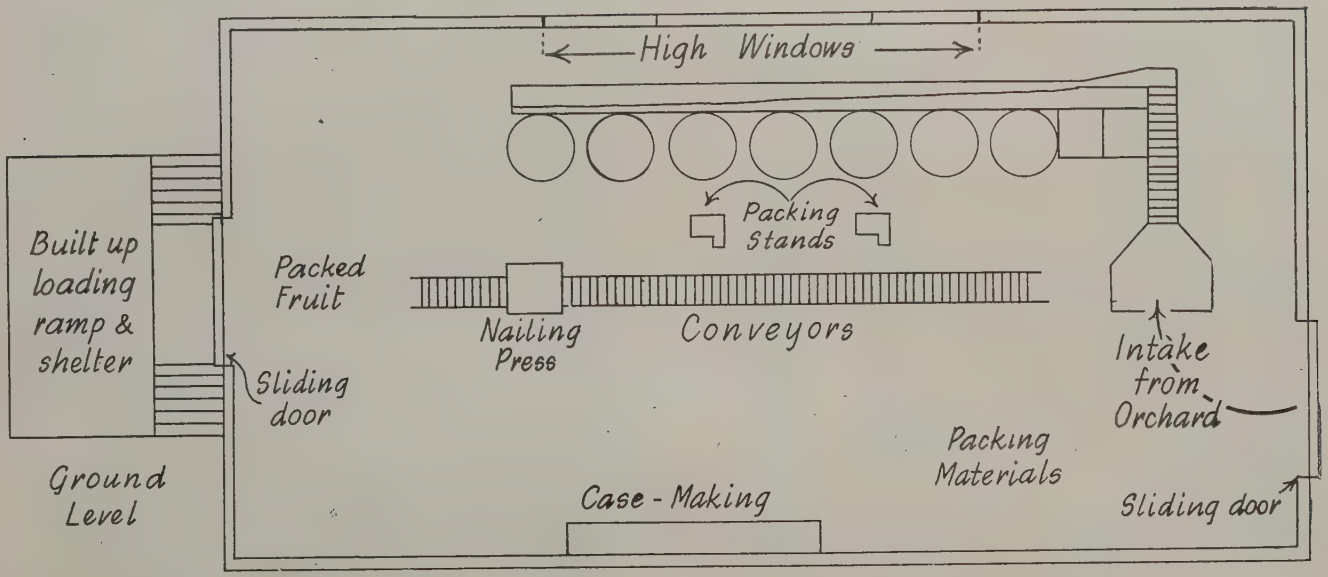
General Packing Shed Lay-out



LEAN - TO STORAGE

for spray equipment, orchard implements and manures.

(Not to Scale)

Fig. 1

THE PREPARATION OF FRUIT FOR MARKETING

Part 1—PACKING SHEDS, THEIR DESIGN AND EQUIPMENT

by
J. S. BLOOMFIELD,
Packing Instructor

Fig. 2.—A seven rotary bin grader fitted against the wall is an ideal set up for the grower with 10,000 to 15,000 cases of fruit to handle

FRUIT production may be divided into three phases, namely, growing, presentation and marketing—each of which is an essential part of the final pattern. The efficiency within each section and the co-ordination between each phase of the industry will determine the ultimate return to the grower. In this regard presentation is a most important feature. For instance, high quality fruit delivered to a good market will lose in value should presentation be in any way unsatisfactory.

There are several factors which have influenced fruit-handling methods in Western Australia. Of these, the distribution of the fruit-growing areas in relation to local markets, and the dependence of the industry on the export trade are the most important. The shortage of adequate cool storage space in the fruit districts also has a bearing on handling methods.

FRUIT AREAS

In the Hills districts within 50 miles of Perth most varieties of fruit can be grown successfully in the limited areas of good soil situated in the valleys and along the watercourses crossing the coastal plain. These areas are ideally suited to the small mixed orchardist growing fruit mainly for local consumption, although in some instances growers are supplying considerable quantities of fruit for export. Citrus, grapes and stone fruits are the main crops, with apples and pears occurring only in the colder localities. In southern areas, however, the climate is better suited to the production of apples and pears and here the export of these fruits is the main consideration of growers. Around this pattern of fruit-growing, the method of handling the fruit—whether by the grower himself or by a centralised packing shed—has been developed.

EXPORT MARKETS

The production of fruit for export to overseas markets has played a large part in the development of fruit growing in this State and at the same time influenced handling methods. Approximately two-thirds of the apples produced are shipped overseas each year either to the United Kingdom, Europe or Singapore and in a favourable season, this export has amounted to more than a million bushels. The Singapore market, apart from receiving substantial shipments of apples, is also a useful outlet for limited supplies of grapes, citrus, pears and stone fruit by virtue of the short journey involved and the frequent shipping facilities available.

IMPORTANCE OF COOL STORAGE

The export of a perishable product such as fruit is closely associated with cool storage facilities. The European market for apples requires shipments to be completed early in June and, as these exports are handled either through the ports of Fremantle or Albany where cool storage facilities are available, there has been little incentive to build large cool stores in the main apple-growing areas. Orchardists nearer to Perth have, up to the present, relied on city cool stores for their needs. Un-

Fig. 3.—In large commercial packing sheds, a series of sizers usually run parallel to each other with gravity rollers taking fruit to the nailing down press from each machine

der these conditions the storage of unpacked fruit is impossible. This means that, with few exceptions, all fruit must be packed shortly after picking and this places an extra burden on packing sheds. With the increase of local population and improved electricity supplies, grower-owned cool stores which will allow fruit to be packed out of store after the conclusion of the picking season, as required for the local market, are likely to become more popular but the volume of fruit handled by this means is not likely to be very large.

SIZE OF PACKING SHED

The size of the packing shed the equipment to be used, and the layout will depend upon the quantity of fruit which has to be handled. Although adequate facilities are necessary for the easy and economical handling of fruit, care must be taken not to over-capitalise the property by installing costly equipment which is far larger than is fully warranted. The apple industry is well served with large packing sheds run by the main exporting companies. These sheds accept fruit from growers at the shed door and prepare it for export. The largest of these concerns packs over 100,000 bushels during a season, with a daily average of 2,000 bushels for the main period and has reached a maximum output of 3,500 bushels in a day.

Two sheds of this size are situated at Bridgetown and one at Mt. Barker. At Donnybrook, Manjimup, Kendenup and Mt. Barker, sheds of 60,000 bushel capacity are operating, while sheds of approximately 20,000 bushels capacity serve Balingup, Mullalyup, Boyup Brook, Argyle, Capel and Albany. In addition, small grower community sheds are operating in the apple districts as well as private

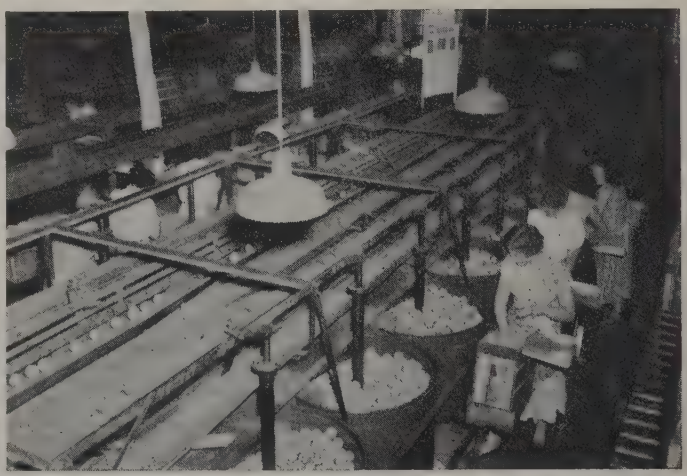


Fig. 4.—Two single-sided machines fitted back to back may be operated as one unit with a common sorting table and a single drive

growers' sheds many of which are well equipped and can handle at least 10,000 bushels in a season.

The size of apple-packing sheds has been determined by the requirements of the industry which are rather different from those of other apple-growing States.

The major part of the apple production comes from six varieties, of which Granny Smith is by far the most important. Over the last ten years, considerable numbers of trees of the early mid-season varieties have either gone out of production or, where suitable, have been worked over to Granny Smiths, while this variety has been dominant in all new plantings. The Granny Smith owes its popularity to the fact that it is ideally suited to West Australian conditions. Not only does it commence to bear commercial crops at an early age but the quality of the fruit is extremely good. The production of Granny Smiths is now approaching the total of all other varieties.

Fig. 5.—Single-sided machines placed back to back with individual sorting tables and drives are an advantage in that each machine operates independently

The necessity of handling the large quantity of Granny Smiths involved, in the limited period available places a severe strain on packing shed facilities. The fruit must not only be wrapped and packed ready for immediate export, but

Fig. 6.—A nine-bin one-sided grader with canvas spring bins will be suitable for the grower packing up to 10,000 bushels

also for storage in anticipation of shipment at a later date. Granny Smiths supplied to the local market early in the season are usually unwrapped but fruit intended for late marketing is always wrapped and packed before cool storage. As a result the sheds must be large enough, and sufficiently well equipped, to handle the large volume of apples in a short period even though for the rest of the year they are not used. In addition the requirements for labour are essentially of a seasonal nature and the difficulty of obtaining skilled packers and shed hands further aggravates the seasonal rush.

The period of harvesting for citrus fruits is much longer than for other fruits. Both on the local market and for export the demand is restricted at any one time and marketing is spread over a large portion of the year. Consequently the citrus grower's requirements for labour are considerably less than for other fruits. He has been able to handle his own crop and central district packing sheds have not been developed.

Stone fruits are generally grown in mixed orchards and are handled by the individual grower with equipment used for other fruits.

PACKING SHED DESIGN

For efficient operation, a packing shed should be designed so that the fruit entering the receiving end will pass through the various stages of preparation with the minimum of handling and congestion, to be stacked at the dispatching point ready for loading. The ideal set-up is for the receiving and dispatching points to be located at opposite ends of the shed with the equipment so arranged that the fruit will pass unimpeded down the length of the building.

In the case of a grower's shed, some modification of this principle may be necessary to make use of an existing building. The design of the shed should be aimed at eliminating all unnecessary handling and reducing lifting to a minimum. Properly-construced ramps at all loading points are very desirable from this point of view and in particular for the large packing shed where unloading and loading are practically continuous operations. From the truck the fruit should be delivered directly on to gravity rollers preferably exending on to the truck. Where the volume of fruit warrants, power-driven conveyor belts or rollers are worth considering.

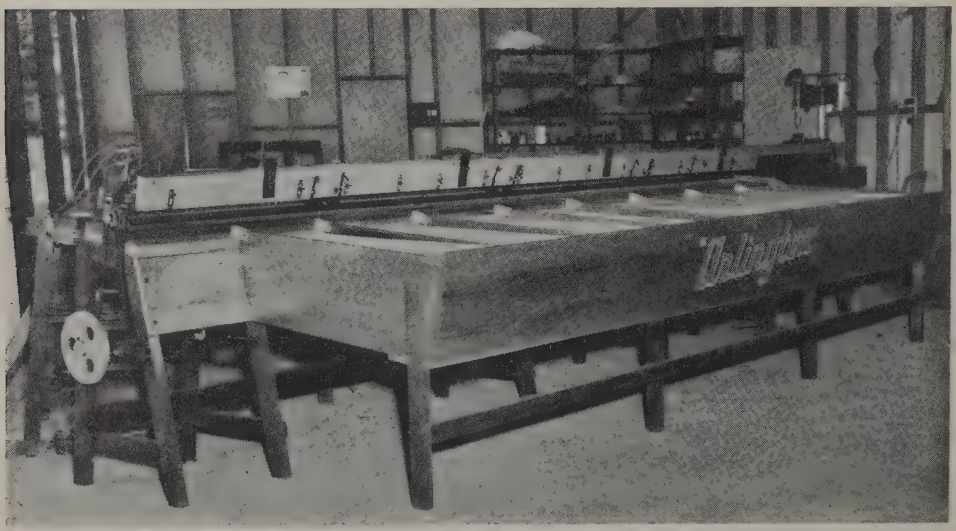


Fig. 7.—An alternative machine to that shown in Fig. 6, constructed in Western Australia

In a grower's shed it is usually an advantage to unload at ground level. The fruit comes into the shed from the orchard on a table top lorry, the boxes stacked one or two high. It is then possible for the person unloading to take them directly from the vehicle and stack them in a convenient position on the shed floor. An important consideration regarding this type of construction is that trucks can back into the shelter of the shed during unloading in wet weather and also it allows the shed to be used as a vehicle shelter during the off season. The loading-out ramp nevertheless should be at truck-top level to avoid unnecessary lifting. This type of shed readily lends itself to construction on a slope.

Fig. 8.—The small mixed orchardist can successfully construct this simple machine with a single sizing roller

Although a wooden floor is easier to work on, from a constructional point of view the small grower would probably find concrete more satisfactory. The cleaning of a concrete floor is also a simpler operation. Consideration should also be given to the weight which the floor will be required to carry. For instance the weight of cases of apples stacked ten high is equivalent to 280 lb. per square foot, or 500 cases would weight approximately 12½ tons.

Adequate lighting and ventilation are most essential requirements. The sawtooth roof which is accepted as the most satisfactory for modern building construction gives a very good uniform lighting throughout the building and should be used wherever possible. Skylights seldom give satisfactory lighting in a large building. The aim should be to have maximum light on the sorting tables and packing bins without direct sunlight or glare.

This may be accomplished by fitting the windows above the packing bench high up in the wall so that the light is above the packer and not reflecting directly into the eyes as would occur if the windows were at eye-level. Where possible, light for the sorting and packing bench should originate in a southerly direction as it is found that this light is softer and gives more even lighting.

Artificial lighting is usually required at some time in all packing sheds and provision should be made preferably for fluorescent tubes when suitable electric current is available.

Ample ventilation should be provided and this may be arranged by the installation of conveniently-placed sliding doors, which, while enabling a through passage of air during the summer, can also be used to prevent draughts in the colder months.

Cool storage is being used to an ever-increasing extent for the handling of fruit before and after packing and where the installation of a cool store is contemplated it is essential that the packing shed and cool store be built as a unit. That is the cool store chambers should open directly into the packing shed.

INTERIOR LAYOUT

The accompanying diagram (Fig. 1) is suggested as a practical layout for a grower's packing shed. The length of the

building should be approximately twice the width, e.g., 60ft. x 30ft. is an ideal size. It will be noted that the fruit from the orchard enters at one end of the building and passes through the various stages of preparation until it is finally stacked ready for loading at the other end. This continuous flow is an important feature in the design. A seven rotary-bin grader complete with hopper and elevator is shown fitted close to the south wall with sufficient room to make adjustments behind the machine and carry out all maintenance work. An illustration of this type of machine is shown in Fig. 2. At a convenient distance from the grader and parallel with it, a gravity conveyor takes the fruit from the packer to the nailing-down press. A short section of conveyor after the nailing press is most helpful for stencilling, wiring, etc., before finally stacking the cases ready for loading out. On the north wall is ample room for packing materials which are centred about the case-making bench conveniently placed so that made-up cases can be stacked in easy reach of packers.

This set-up, with three experienced packers, could handle up to 350 cases per day. Where slightly larger quantities of fruit have to be packed the addition of two more bins would provide work for another packer. The maximum output of a single-sided machine would be approximately 500 cases per normal day. Where the quantity to be handled is in excess of this, then it would be necessary to install further machines. In the larger commercial sheds it is usual for a series of sizing machines to run parallel to each other (as shown in Fig. 3) with the necessary gravity rollers between, feeding the several nailing presses. Single machines are satisfactory for wall positions but in central positions it is preferable to place sizers back to back. These double machines may be run either as a single unit (as in Fig. 4), that is with a common sorting table and single drive, or the two halves may operate as separate units (as in Fig. 5). The latter arrangement is preferable as it enables two different lines of fruit to be run at the same time. Due to the number of cases needed in a large shed the case-making section is usually located off the packing floor in an elevated position so that the cases can be fed direct to the packers by chutes.

Growers with small mixed orchards may find that imported graders are too large and expensive for their needs. To meet the need of the small orchardist some locally made graders, as shown in Fig. 7, are available. Several very creditable machines have been built by growers themselves. One of these is shown in Fig. 8.

Regardless of the size of the packing shed, the economical handling of fruit will depend upon the equipment available, its arrangement to enable operators to make full use of modern machines, and the ability of the management to set up and maintain them in efficient working condition.

(To be continued.)

SPECIMENS HELP DIAGNOSIS

WRITTEN descriptions of plant diseases are often insufficient for accurate diagnosis. Send specimens, preferably several, showing the disease at various stages. They will usually carry well if wrapped in moist newspapers and enclosed in well-ventilated containers.

DEEP LITTER FOR POULTRY

by

L. J. GAFFNEY, B.Sc. (Agric.),
Poultry Adviser

Fig. 1.—A pen of Australorp hens provided with comfortable and hygienic conditions under the deep litter system

NOT so many years ago it was customary for poultry farmers in Western Australia to clean out the droppings from their poultry sheds at daily or weekly intervals. Now, however, the majority of commercial poultry farmers clean out their sheds once yearly. This tremendous saving in labour has been achieved through the introduction of the deep litter system which entails no sacrifices of hygiene or comfort and which actually contributes to a general overall improvement in management.

Deep litter is a composted mixture of a suitable litter material and poultry droppings, developed over a period of six months or more and maintained in a dry, friable condition. The most important function of the litter is to absorb moisture from poultry excreta which contains about 80 per cent. of water when voided. This moisture is subsequently disposed of by evaporation and is also utilised in decomposition.

Various types of litter materials are used, such as sawdust, wood shavings, grain hulls, chopped-up straw, etc.; the essential requirements of the litter material being that it is cheap and plentiful, has adequate water-absorbing powers, is reasonably coarse so that packing does not readily occur, and in addition it must of course be capable of decomposition.

Let us first outline some of the features of deep litter as it concerns poultry farmers in Western Australia. A brief account of the history of the practice may be of interest.

The origin of deep litter dates back many years but it was during World War II that the system first achieved widespread prominence. Poultry farmers in the U.S.A. adopted the deep litter system as a temporary measure to help cope with the labour shortages and it was not very long before they realised that deep litter was one of the outstanding labour-saving practices of the century.

The results achieved with deep litter attracted the interest of scientists from many fields, and an extensive programme of investigatory work was commenced and is still continuing today at a high level. Research work in the fields of nutrition, disease, and manurial value uncovered a wealth of knowledge and as new facts were brought to light, so the subject of deep litter has become more complex.

SOURCE OF VITAMIN B_{12}

Firstly, came the astonishing discovery that deep litter could contain significant levels of vitamin B_{12}, the more recently identified vitamin which plays a vitally important role in animal nutrition. This had a tremendous impact on the industry in U.S.A. because it was shown that vegetable proteins generally were lacking in this essential vitamin, and most of the protein fed to poultry in that country was from vegetable sources. Chickens reared

g. 2.—Deep litter with portion removed to show the epth of the layer (in this case between 10 and 11 ches). A good deep litter should be dry and friable throughout its entire depth

on deep litter showed remarkably increased growth rates because the diet was supplemented by the growth-promoting vitamin B_{12} contained in the litter. When chickens were fed a diet containing adequate levels of animal protein, they did not respond in the same way to the deep litter because the vitamin B_{12} was being supplied in the animal protein. Thus the term animal protein factor (or A.P.F.) was evolved to denote a complex of factors which are contained in animal protein but which are lacking in vegetable protein, and of which vitamin B_{12} is the best known and of foremost importance in poultry nutrition.

HYGIENE

The aspect of deep litter in relation to poultry hygiene has evoked considerable investigational work but most of the findings on the matter have been inconclusive. However, practical experience has proved that the proper use of deep litter presents no greater disease hazard than methods hitherto practised and it can be claimed that a good deep litter is less perilous from a disease aspect than the soil of poultry runs. The deep litter system has been primarily responsible for the successful housing of laying birds intensively on a commercial scale.

The importance of maintaining the body of litter in a dry condition cannot be over-stresed and the dryness of the medium largely accounts for its sanitary properties. It has been postulated that in a properly kept litter, a population of favourable micro-organisms is maintained rather than a populace of disease organisms. A friable and well-aerated litter encourages the favourable bacteria which present strong opposition to the unfavourable ones. There is reason to believe that ammonia and other disinfecting materials contained in the litter tend to suppress any sudden build-up of micro-organism activity. Whatever the reason may be, there is little doubt that a properly kept deep litter presents a suitably hygienic environment to poultry.

MANURIAL VALUE

The manurial value of deep litter holds particular interest to those farmers who wish to obtain full value for this poultry by-product. Under the deep litter system, a poultry farmer handles a considerable bulk of organic material. Apart from the fertiliser requirements of his own green-feed plot and vegetable garden, most of this material is sold for horticultural use and it is keenly sought after by market gardeners, orchardists, vignerons, and graziers. Besides containing good levels of nitrogen, phosphorus, potassium, and calcium, and a wide variety of other elements, it supplies large quantities of organic material to the soil. It is, therefore, particularly useful as a general fertiliser in building up the fertility of soils deficient in organic matter and lacking many of the elements necessary for plant growth.

THE DEVELOPMENT AND MANAGEMENT OF DEEP LITTER

The term "deep litter" was originally applied when a good depth of litter material was used in the initial development. Built-up litter, on the other hand, is produced by commencing with only a shallow layer of material and adding fresh material to this whenever the capacity to absorb moisture diminishes. The method adopted locally is to commence with a layer of dry sawdust or shavings 1in. to 2in. deep and this, incorporated with the droppings, is left to accumulate for 12 months, when it is removed. With this method, difficulty is usually encountered in maintaining the litter in a dry and friable condition during the winter

Fig. 3.—Cleaning-out operations have commenced in this large intensive shed. All the deep litter will be removed and sold, the perches and woodwork near the floor sprayed with creosote, the cement floor disinfected with 2% caustic soda solution and liberally sprinkled with hydrated lime prior to adding 2in. of clean, dry litter material

months. Despite vigorous efforts on the part of the farmer to keep the litter well-worked, the excessive amount of moisture promotes surface caking and the birds are unable to scratch in the litter and the whole body tends to pack. Before this condition arises, it is a sound practice to add one inch of clean litter material on top of the old litter. This provides a fresh layer of moisture-absorbing material which, in turn, is gradually transformed by the process of decomposition. One or two further applications of clean material will usually be found necessary during the winter months, and at the end of 12 months a substantial depth of litter is built up. When the depth becomes excessive, all or part of the old litter can be removed and fresh litter added. It is best to commence the build-up of litter during the summer months when the dry atmosphere promotes the evaporation of moisture.

ADDITION OF HYDRATED LIME

In the initial development of deep litter, several applications of hydrated lime are stirred-in with the litter material. A thin coating of hydrated lime placed on the cement floor assists in preventing the litter from caking on the surface of the floor, where a certain amount of dampness usually occurs. Liming promotes decomposition and should be carried out whenever fresh litter material is added. As a guide, a total of 2 lb. of hydrated lime per 10 sq. ft. can be applied over three or more dressings during the first three months. Thereafter, further liming may not contribute very much towards keeping the litter dry, but usually a light application is made whenever the litter is turned over, as this assists in keeping it in a friable state. If the farmer uses the litter for fertilising his own land, it is a good scheme to occasionally apply a superphosphate dressing rather than hydrated lime. Experiments conducted in U.S.A. indicate that the addition of superphosphate reduces the escape of ammonia and thus the nitrogen content of the litter is retained, making it more valuable as a fertiliser.

CAUSES OF DAMP LITTER

Damp litter can present a serious hazard to poultry. Apart from the disease element, harmful and obnoxious fumes are evolved when the litter becomes damp. During wet weather it is often difficult to maintain the litter in a dry condition, and this depends largely on the construction of the poultry house. Driving rain, spillage from water vessels, insufficient ventilation and overcrowding are the most common causes of the litter being damp and difficult to work. The farmer should look to these possible causes and rectify them even if it means modifying the structure of the shed.

(To be continued.)

Fig. 4.—Several tons of deep litter are developed over 12 months and this market gardener had little difficulty in obtaining a truck-load. Where poultry are run in conjunction with horticulture the deep litter from the poultry sheds is of considerable value to the farmer

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INFECTIOUS KERATITIS (PINKEYE) IN CATTLE

A Common Summer Complaint

DURING the summer and autumn months, "pinkeye" is frequently prevalent amongst cattle in the South-West where it may become a source of considerable loss and inconvenience to dairyfarmers and graziers.

The earliest symptom consists of a watery discharge from the eyes which soon becomes purulent and there is usually evidence of discomfort upon exposure to light. Later the cornea becomes cloudy and opaque and is sometimes deeply ulcerated. Rupture of the cornea with blindness in the affected eye is not uncommon.

In beef cattle there is considerable loss of condition while in dairy cows the milk yield may be greatly depressed. Without appropriate treatment, several weeks will elapse before recovery occurs.

The disease is highly contagious, spreading most rapidly when cattle are herded in close contact with one another, and flies are believed to play an important part in the dissemination of the infection. It is therefore advisable, as soon as the disease makes its appearance, to isolate affected animals from the remainder of the herd.

For the treatment of the disease the application of chloromycetin eye ointment is recommended. This preparation is available from chemists in $\frac{1}{8}$ oz. tubes. In early cases, two applications separated by an interval of 12 hours will usually effect a cure but in long-standing cases several treatments may be necessary before the desired result is obtained. A thin ribbon of the ointment about an inch in length should be squeezed on to the tip of the finger and smeared inside the lower eyelid.

While treatment of this kind presents no difficulty with dairy cattle or with quiet stud animals it is generally impracticable with beef herds which would be required to be yarded and put through a crush twice daily. Such herds should, however, be transferred to a paddock where there is heavy shade and easy access to feed and water.

Other applications which have been recommended for the treatment of pinkeye include penicillin in oil (the tubes of penicillin suspension as supplied for the treatment of mastitis may be used for this purpose), and eye lotions such as 20 per cent. argyrol or 10 per cent. zinc sulphate, but while cheaper than chloromycetin none of these preparations is nearly as effective.—C.R.T.

FREE BOOK ON GENETICS

The Department of Agriculture still has a few copies of Dr. A. L. Hagedoorn's booklet "A Geneticist Talks with Australian Animal Breeders," and will make them available free of charge to farmers.

Dr. Hagedoorn, the famous Dutch geneticist, visited Australia in 1949 and gave over 80 talks to farmers and stockbreeders.

In this booklet, the publication of which was sponsored by the Commonwealth Scientific and Research Organisation, the main points of his talks have been placed on record together with a selection of the many questions asked at his lectures and the answers given by him.

Farmers wishing to obtain copies should apply without delay to The Publications Officer, Department of Agriculture, St. George's Terrace, Perth.

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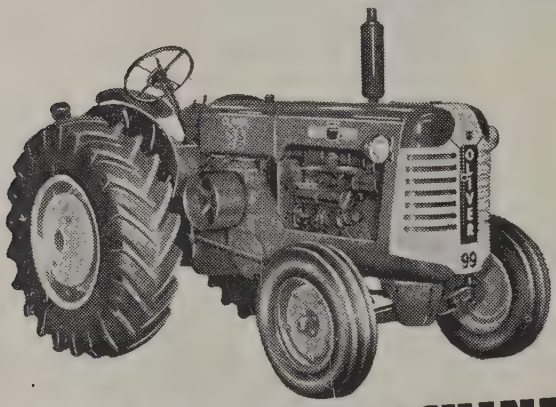

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FRUIT FLY CONTROL

A Jeep-Operated Spraying Outfit

By J. A. MALLETT

THE Eastern Hills Fruit Fly Foliage Baiting Scheme is one of three similar schemes operating in the fruit-growing districts of Western Australia, the other two being located at Donnybrook and in the South Suburban (Armadale-Kelmscott) area. They are designed to prevent losses from the attacks of the Mediterranean Fruit Fly (Ceratitis capitata) by weekly foliage baiting with a solution of sodium fluosilicate and sugar in water.

The Compulsory Fruit Fly Baiting Act, a subsidiary measure to the Plant Diseases Act, was brought into being to provide for the introduction of these baiting schemes, which may be inaugurated at the request of district organisations providing that 60 per cent. of the growers voting at a special poll are in favour of the scheme.

In 1951, a poll of growers in the Glen Forrest, Parkerville, Mundaring, Sawyers Valley and Mount Helena districts resulted in a favourable vote and the Eastern Hills Fruit Fly Foliage Baiting Scheme came into being.

This scheme called for the weekly spraying of trees on about 750 properties spread over an area of some 70 square miles. The properties ranged from "back-yard orchards" with one or more trees, to commercial orchards up to 40 acres in area.

Fig. 1.—Baiting two rows of trees with the jeep-operated outfit.

Finance for the scheme was provided by a Government subsidy, plus a scale of fees charged to growers for the season's spraying operations. The following fees were charged:—

	£	s.	d.	
1 - 4 trees		9	0	
5 - 9 „	1	0	0	
10 - 19 „	1	12	6	
20 - 29 „	2	1	0	
30 - 49 „	2	10	0	
50 - 99 „	2	12	6	
100 and over	2	14	0	per hundred.

Soon after the scheme came into operation, three local orchardists, Messrs. C. Cappelletti, G. H. Tournay and E. Brindle —all of whom were members of the districts' Fruit Fly Baiting Committee— evolved a tractor-mounted spraying outfit operated by compressed air which proved particularly successful.

This unorthodox but highly satisfactory outfit was described in the Journal of Agriculture, March-April, 1952, and the description was reprinted in Bulletin No. 1092, which is available upon application to the Department of Agriculture.

In 1953 the Fruit Fly Baiting Committee purchased a Willys jeep and fitted it with a similar type of compressed air outfit. This consisted of a 40-gallon steel air receiver which carries the solution of fluosilicate and sugar used for foliage baiting. The power take-off of the jeep operates a Clisby compressor which builds up the normal working pressure of 50 to 60 lb. per square inch when the jeep has been running for about two minutes in neutral gear. After this, the pressure is maintained at ordinary running speeds.

The compressor is fitted with a safety valve and a length of hose which carries the compressed air to the steel container. A pressure gauge is fitted to the dashboard of the jeep where it can easily be read by the operator. From the container, hoses run to two Edgell pistols with spraying nozzles situated one on each side of the jeep.

Working between the rows the jeep can spray 2,500 trees an hour under ideal conditions using an average of a gallon of spray solution to each 40 trees.

ADVANTAGES

Using the jeep-mounted outfit little time is lost in travelling between properties, as the vehicle can maintain good road speeds. A second man can be carried, together with two knapsack sprays where required. It is thus possible for the jeep to proceed with the major spraying operations on a property while the man with the knapsack spray can attend to trees in awkward positions such as in house gardens or trees situated on the far side of creeks or gullies and in other spots difficult to reach by vehicle.

At present the committee is operating the tractor-mounted compressed air spray and four knapsack sprays in addition to the jeep-mounted outfit, and the scheme has been highly successful.

Fig. 2.—The jeep operates successfully even on steep slopes.

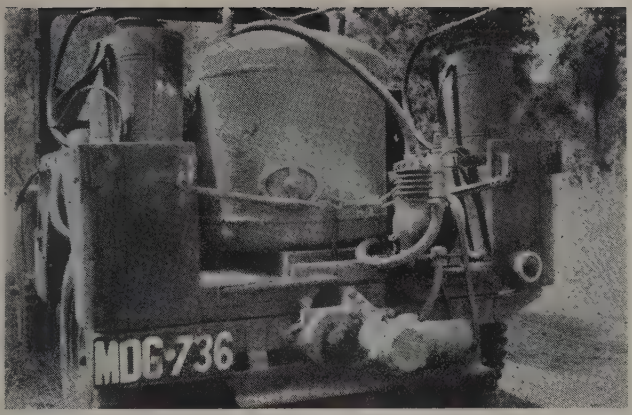


Fig. 3.—Close-up of the compressor and receiver, showing how the compressor is operated by a V-belt drive from the power take-off of the vehicle. Note the two knapsack sprays carried to bait trees in places where the jeep cannot operate conveniently.

TANGIBLE BENEFITS

Prior to the introduction of the foliage baiting scheme nearly 200 cases of fruit per year from this area were condemned at the markets owing to fruit fly infestation. In the first year of the scheme's operation 13 cases were condemned and in the second year only one case was rejected.

Although many growers carried out their baiting obligations with meticulous care before the scheme came into operation, they were always liable to suffer losses through the carelessness of neighbours. With every tree in the district baited every week the fruit fly infestation has been brought under control and this may be illustrated by quoting a few individual cases where outstanding results have been achieved.

One grower with about 15 acres of orchard, produces annually aproximately 80 cases of very late (Salway) peaches which were almost invariably so badly infested with fruit fly that he had the responsibility of destroying all this fruit at considerable cost in time and labour. In the first year of baiting operations he marketed 70 per cent. of his crop of this variety and in the second year of operation he marketed the whole quantity, thus gaining probably three times the amount he paid out in baiting fees under the scheme.

Another grower with 15 acres of mixed varieties, disposes of the whole of his fruit through his own roadside stall. In the 1952-1953 season for the first time he sold all his fruit tree-ripened and had no losses from fruit fly.

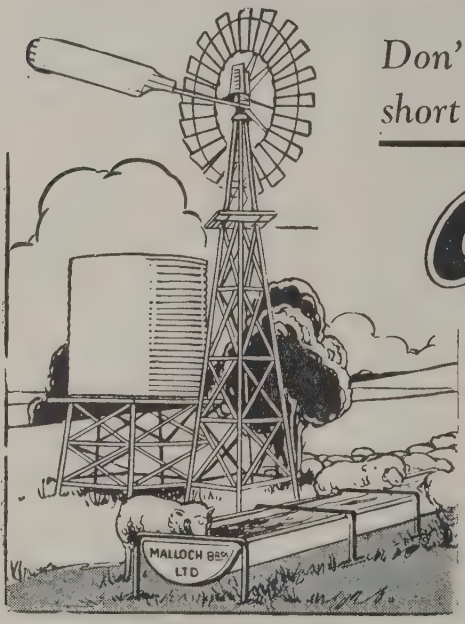
Still another orchardist produced nearly 11,000 cases of fruit—mainly pears—and in all this quantity only three fruits were found with possibly fly strike, despite the fact that picking was not completed until the end of May and that pears were in very forward condition.

A new grower who entered into his property in the middle of the season and produced large numbers of Bartlett pears was only able to market six cases of this variety prior to the establishment of the baiting scheme. In the first year of the scheme's operations he marketed 136 cases and in the second year over 700 cases. These yields were from the same trees and there was little variation in the actual seasonal yields so that in this case he showed a substantial profit after paying fees of about £21 a year.

The fact that the Great Eastern Highway runs through the baiting area constitutes one of the greatest threats to the security of orchardists in this district. On a number of occasions infested fruits obviously thrown from cars have been picked up by the roadside and in one case a large heap of badly-infested fruit was dumped on the side of the road.

The majority of the growers realise that the risk of heavy infestations resulting from such acts, or from the negligence of individual orchardists, is greatly reduced by the comprehensive baiting scheme.

Many realise, too, that the scheme leaves them free to attend to their routine tasks at periods when labour is scarce. Under such conditions, time that would normally be needed for baiting the trees can often be utilised much more profitably on such tasks as picking and packing.



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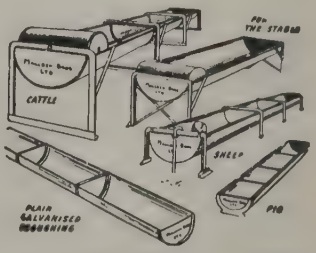

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TREES OF WESTERN AUSTRALIA

By C. A. GARDNER.

No. 22—THE DUNDAS MAHOGANY
(Eucalyptus Brockwayi C. A. Gardn.)

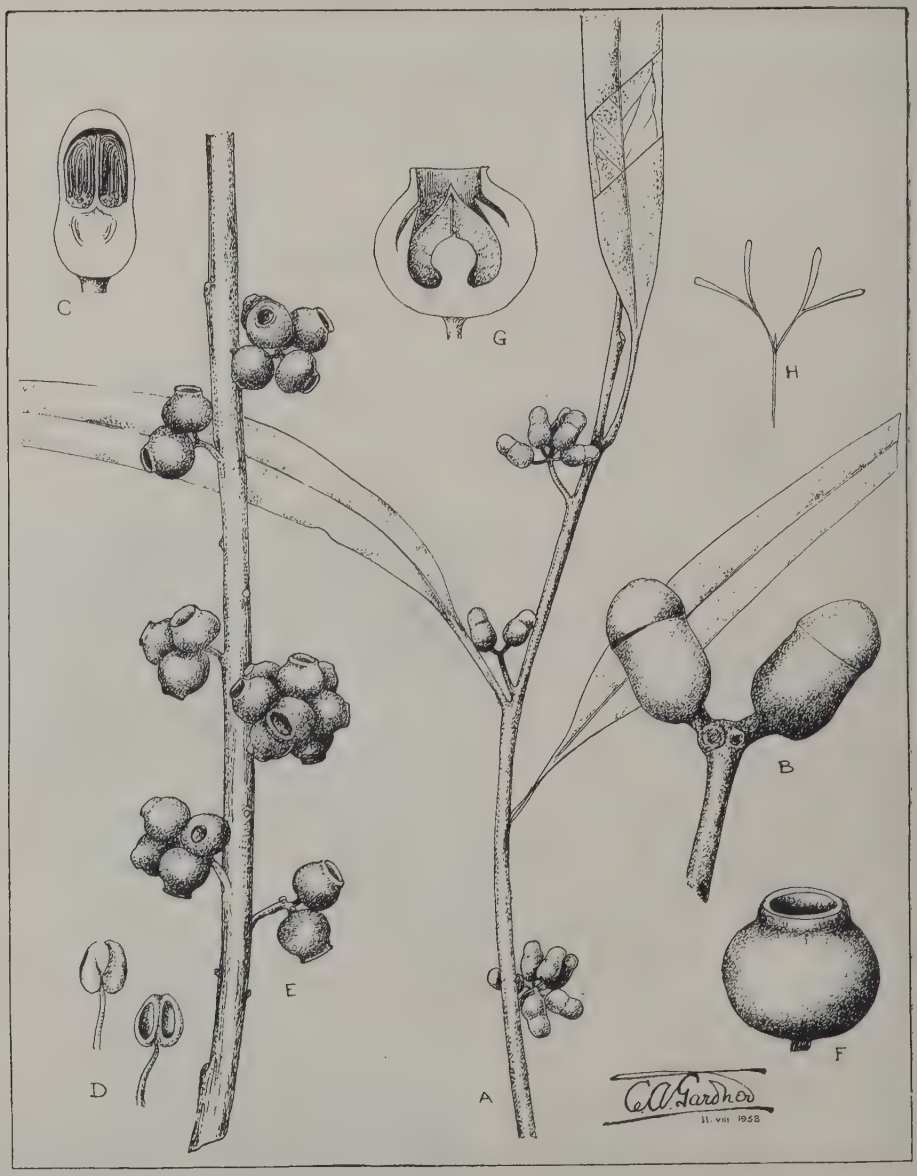
AMONG the most popular trees for planting in the agricultural areas is the Dundas mahogany which, while closely resembling the salmon gum superficially, is even more attractive because of its deeper green crown and paler-coloured bark. Like the salmon gum it thrives in low rainfall areas in loamy or sandy loamy soil.

The tree is indigenous to the Norseman district where it attains a height of 80 feet when well grown, with a broad crown of deep lustrous foliage, and a smooth-barked trunk up to three feet in diameter. Resembling the salmon gum in general appearance, the tree may be distinguished in the field by the usually paler bark, and particularly by the bark characteristics—in fracture it is a deep blood-red in colour, gummy and very astringent to the taste. This "gummy" character is associated with a high tannin content, which is as much as 42 per cent. in samples tested. The timber is red like that of the salmon gum, and straight-grained, but with longer fibres, and when axe-handles were in short supply during World War II, this tree provided a useful timber for the purpose, being much like that of the brown mallet. This indicates an elasticity which may be valuable when the tree is considered as a source of timber. It is apparently no more termite-resistant than the salmon gum.

The Dundas mahogany occurs freely in the Norseman district where it is associated with the greenstone formations of the area, occurring usually on flats or the lower slopes of hils, and associated with salmon gum, morrell, merritt and the Dundas blackbutt.

The young plants are distinctive by reason of their very narrow and somewhat crowded foliage, and until they attain a height of about 15 inches they

Fig. 1.—The Dundas Mahogany (*Eucalyptus Brockwayi* C. A. Gardn



DUNDAS MAHOGANY *(Eucalyptus Brockwayi,* C. A. Gardn.). A—Branchlet with leaves and flower-buds; B—Flower buds; C—Flower-bud in section; D—Anthers; E—Branchlet with fruits; F—Fruit.; G—Fruit in section; H—Cotyledons. (B, C, F and G enlarged.)

10 m. N.W. from Norseman,
Brockway and Gardner.

Icon origin.

resemble a tea-tree rather than a Euclayptus. Later on they change abruptly from this narrow form of leaf to the normal form.

Fig. 2.—Dundas Mahogany showing size and general appearance of trunk.

Farmers will find this tree a useful shade tree for the agricultural areas, especially in the loamy soils of salmon gum country. It is of fairly rapid growth, provides a broad crown (provided the trees are well spaced), and the indications are that it is fairly salt-tolerant. Young plants are obtainable from the nursery of the Forests Department at Kalgoorlie. Planting should be done in late April or early May for the best results.

The name *Eucalyptus Brockwayi* commemorated George Ernest Brockway, former Superintendent of Inland Forests at Kalgoorlie, who first collected speciments of this tree in 1940.

BOTANICAL DESCRIPTION

Tree 60-80 feet tall, the trunk up to 25 feet in length, and 2-3 feet in diameter. Bark smooth throughout, white or salmon-coloured, the outermost layers peeling off in thin purple patches, the new bark white, deep red in fracture, "gummy" and astringent. Timber red. Branchlets reddish, acutely angular. Leaves alternate, stalked, spreading or drooping, narrow-lance-shaped, rather thick, deep green on both sides lustrous, copiously oil-dotted, the lateral nerves relatively few and diverging from the midrib at a rather wide angle the intramarginal nerve distant from the leaf-margin. Umbels axillary and lateral, solitary, mostly 5-8-flowered, the peduncle spreading, slightly compressed, 1cm. long; pedicals short, mostly 1mm. long, slender. Buds smooth. Calyx-tube shortly cylindrical, broad and rounded at the base, 4 mm. long; operculum hemispherical or broadly ovoid, much shorter than the calyx-tube, obtuse. Filaments yellowish-white, inflected in the bud; anthers ovoid, versatile (attached by the middle) opening in distinct longitudinal separate slits. Fruit urceolate-globular, smooth, much contracted and shortly cylindrical at the summit, 6 mm. diameter, the margin elevated, the disc vertical and lining the orifice of the calyx-tube, the valves included, broadly deltoid. Fertile seeds black, ovoid, smooth; cotyledons Y-shaped.

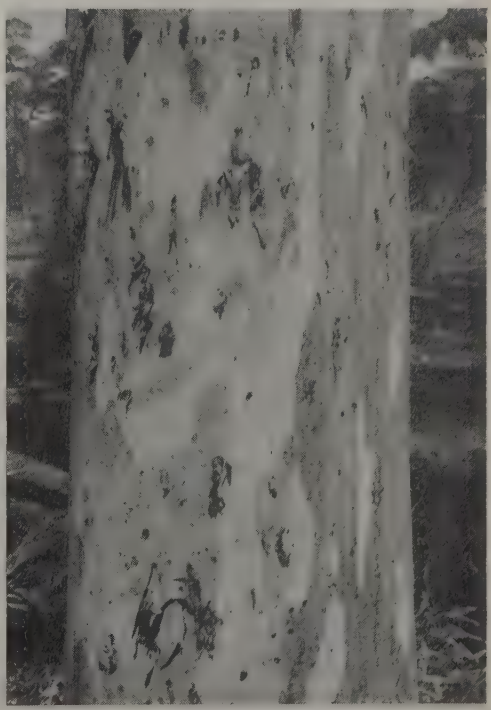
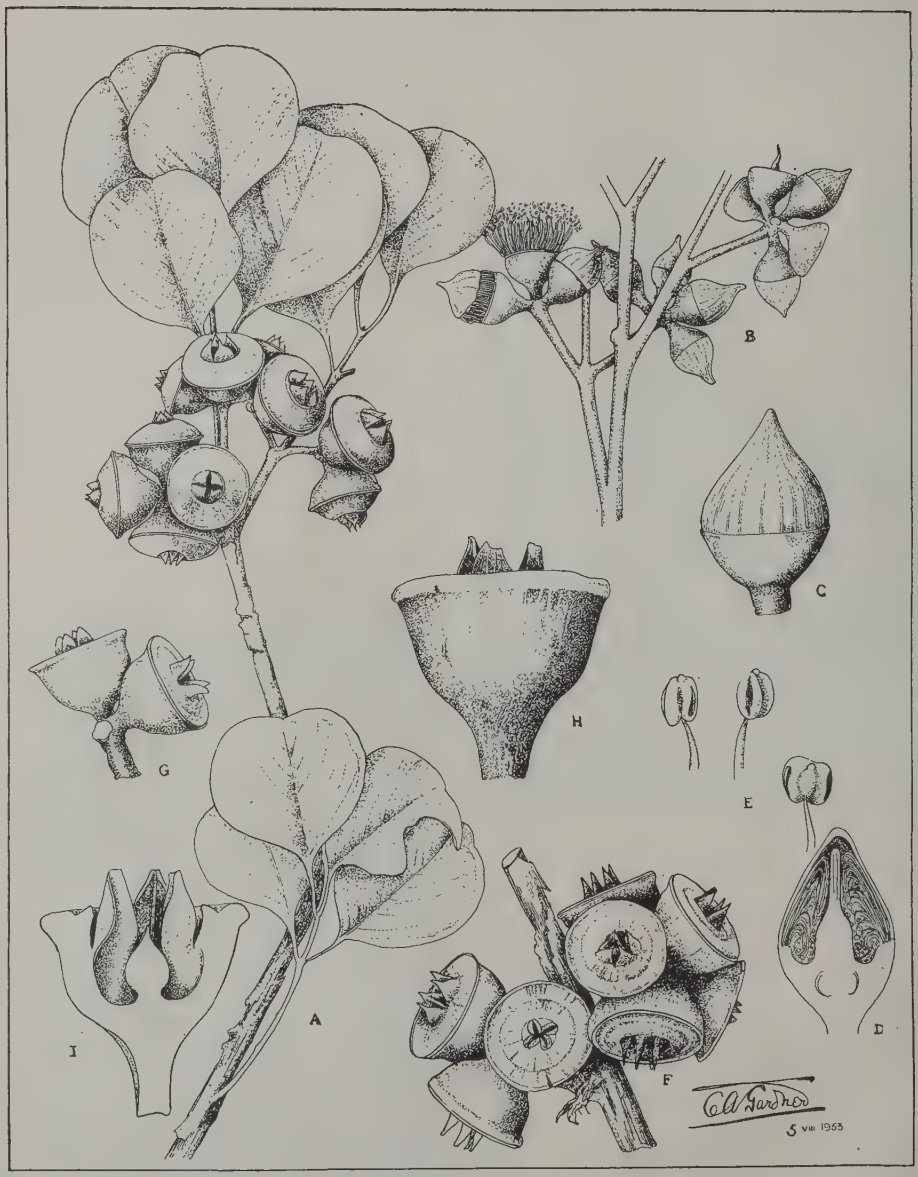


Fig. 3.—Close-up showing typical bark of the Dundas Mahogany.



ROUND-LEAVED MALLEE (*Eucalyptus orbifolia*, F. Muell). A—Branchlets with leaves and fruits; B—Flower-buds; C—Flower-bud; D—Flower-bud in section; E—Anthers; F—Fruits; G—Two buds detached from the umbel; H—Fruit (enlarged).

Pigeon Rocks,
G. E. Brockway, 1940.

Icon origin.

No. 24 THE ROUND-LEAVED MALLEE

(Eucalyptus orbifolia F. Muell.)

PERHAPS no other species of Eucalyptus has proved of so much interest to botanists as has Eucalyptus orbifolia. In 1865, Charles Harper, while exploring country to the east in search of land suitable for grazing, collected at the foot of granite rocks in latitude 30° 47′ and longitude 119° 25′ a small fragment of Eucalyptus consisting of two or three leaves, one flower bud and one expanded blossom. There were no fruits collected. This fragment was described by the Government Botanist of Victoria, Baron Sir Ferdinand Mueller, under the above name, and the specimen was sent to the Royal Botanic Gardens, Kew, where it exists today. The original locality is close to Tin Hill on the track leading from Southern Cross to the Koolyanobbing Range, but it remained undiscovered, despite searches for it until May, 1940, when Mr. G. E. Brockway found it at Hospital and Pigeon Rocks to the west of Mulline and northwards from Bullfinch respectively. Still more recently it has been found 14 miles north-easterly from Weira Siding.

The plant has been raised from seeds from these localities, and will shortly be available for distribution from the Kalgoorlie Nursery of the Forests Department. It is a mallee attaining a height of 25 feet, and is of attractive appearance by reason of its striking bark like that of *E. caesia*, and its white branches, buds and fruits, and particularly its curiously rounded notched leaves. A characteristic not observed in any other *Eucalyptus*, and noted by the boanists of the last century is the extraordinary thickened style (see fig. D) and the very rigid and prominent valves which protrude from the hemispherical-bell-shaped fruits.

As observed by Charles Harper, the species is as far as we know restricted to granite outcrops, but this should not prevent it from being cultivated in many types of soil in gardens. The flowers (filaments) are yellowish-white.

BOTANICAL DESCRIPTION

Mallee attaining a height of 25 feet, although usually about 18 feet tall, the stems 5-6 cm. thick, with a warm red flaky striated thin persistent bark which decorticates leaving a pale green bark between the persistent strips. Branchlets reddish-covered with a powdery-white bloom. Leaves alternate petiolate, broadly obovate-orbicular, shortly tapering at the base, 3-7 cm. long, obtuse or retuse, grey-green in colour, the lateral nerves parallel, not numerous the intramarginal nerve irregular and remote from the margin. Peduncles axillary or lateral erect-spreading straight slightly angled, 1.5-2.5 cm. long, bearing an umbel of from 2-5 flowers; pedicels 5-9 mm. long. Calyx-tube almost hemispherical, 5 mm. long and 8 mm. diameter; operculum hemispherical-conical to ovoid-conical, longitudinally striated, longer than the calyx-tube. Filaments yellowish-white, inflected in the bud; anthers ovoid-orbicular, opening in distinct longitudinal slits; style thick and turgid in the lower part, contracted above the middle. Fruit companulate-hemispherical, woody, 1 cm. long, 1.7 cm. broad, flat-topped, the disc covering the top, the valves deltoid-subulate, very rigid and exserted. Fertile seeds black, not winged. Cotyledons Y-shaped.

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GUNGUNNU *(Eucalyptus caesia,* Benth). A—Branchlets with buds and fruits; B—Leaf; C—Flower-bud in section; D—Flower with the filaments commencing to expand; E—Anthers; F—Fruit in section; G—Seeds.

Perth, W.A. Icon Origin.

No. 23—GUNGUNNU

(Eucalyptus caesia Benth.)

FOR the want of a good descriptive common name for this handsome mallee I have used the name which Richard Helms stated was used by the aborigines of the Fraser Range district. Helms stated that the natives ate the roots of his species. As far as I can ascertain, the specimens recorded by Helms were from 40 miles N.W. from Fraser Range. The specific names "caesia" is from the Latin caesius (blue of the eyes) and refers to the blue-grey or pale grey powdery appearance of the leaves, and more particularly the branchlets, buds and fruits. The flowers are a pale rose-pink in colour.

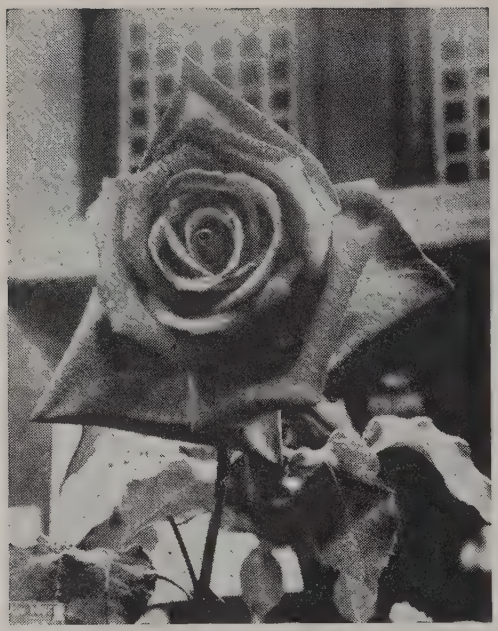
This species, usually a mallee 18 to 20 feet tall, but with the branches and foliage often measuring more in diameter, is well known in cultivation. It is particularly handsome in that it combines an attractive bark with white branches, blue-green leaves and masses of rose-pink blossoms and attractive fruits. It is one of the few *Eucalyptus* species which confine themselves under natural conditions to the vicinity of granite outcrops, hence we find it recorded from a few widescattered localities, such as Uberin Hill near Dowerin, Mount Caroline southwards from Kellerberrin, the rocks of Warren Double Cunyon northwards from Westonia, the vicinity of the Fraser Range, and the Victoria Desert. In all of these it is nowhere so common as around Mount Caroline, and perhaps there are no more beautiful examples than the small broad-leaved mallee form that is found northwards from Westonia. The plant was first collected by James Drummond when he made his Fifth Collection—a trip that took him from Toodyay through Tammin, Karlgarin and Mount Short to the Ravensthorpe district and Middle Mount Barren in 1849.

The bark is longitudinally crisped, the narrow flakes of cinnamon coloured bark disclosing an under-bark of pale green. An exactly similar bark is to be found in other inland species associated with granitic rocks, namely, *E. Kruseana, E. crucis, E. orbifolia, E. Websteriana* and some forms of *E. leptopoda.* It has also been observed in one locality to be a peculiarity of *Eucalyptus Drummondii,* which has typically a smooth white bark.

The Gungunnu has no close relatives. The fruits are shaped something like those of the marri or red-gum, but the flowers and foliage are entirely different. It also has a general resemblance to *Eucalyptus sepulcralis,* a small tree of the Ravensthorpe district, but the resemblance here also is restricted to the shape of the fruits. It is really an anomalous species scattered over a wide area with a very restricted soil type. This, however, does not prevent its being cultivated in many types of soil. It thrives, for example, in the sands of the metropolitan district, and equally well in the sandy loams of the interior. It is recommended for planting for ornamental purposes.

BOTANICAL DESCRIPTION

A shrub or mallee, 15-20 feet tall, rarely a small tree. Bark of the stem and branches rough, with longitudinal strips of cinnamon-brown bark with crisped margins revealing a pale green inner smooth bark. Timber pale brown. Branchlets smooth, covered with a white or blue-white powder. Leaves alternate, stalked, spreading or drooping, ovate-lanceolate to lanceolate, tapering at the apex, grey-blue in colour on both surfaces, the midrib prominent, the lateral nerves not numerous and diverging from the midrib at a moderately wide angle, the intramarginal nerve remote from the leaf-margin. Oil-dots few and scattered. Umbels axillary, lateral, or rarely forming terminal panicles by leaf-abortion, the slender peduncles recurved, 2-3 cm. long; pedicels slender, 10-15 mm. long, thickened upwards. Buds powdery-grey. Calyx-tube campanulate, striate with fine longitundinal lines otherwise smooth; 1-1.5 cm. long; operculum umbonate-hemispherical, smooth, the umbo somewhat broad and very obtuse. Filaments incurved in the bud, rose-pink in colour; anthers nearly orbicular, versatile, opening in broad lateral slits. Fruit urn-shaped, 18-20 mm. long, powdery-grey-white, striated with fine lines, the disc broad and sloping inwards, the capsule with broad included valves. Seeds hemispherical-ovoid; cotyledons Y-shaped.



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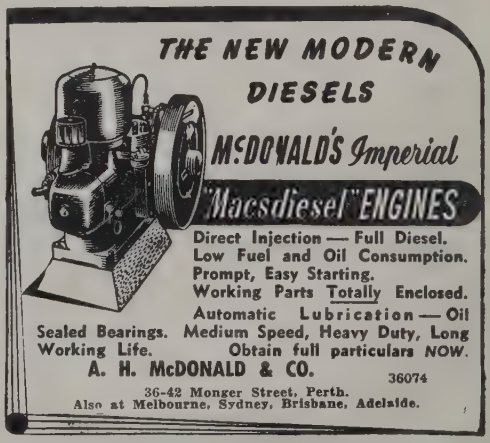

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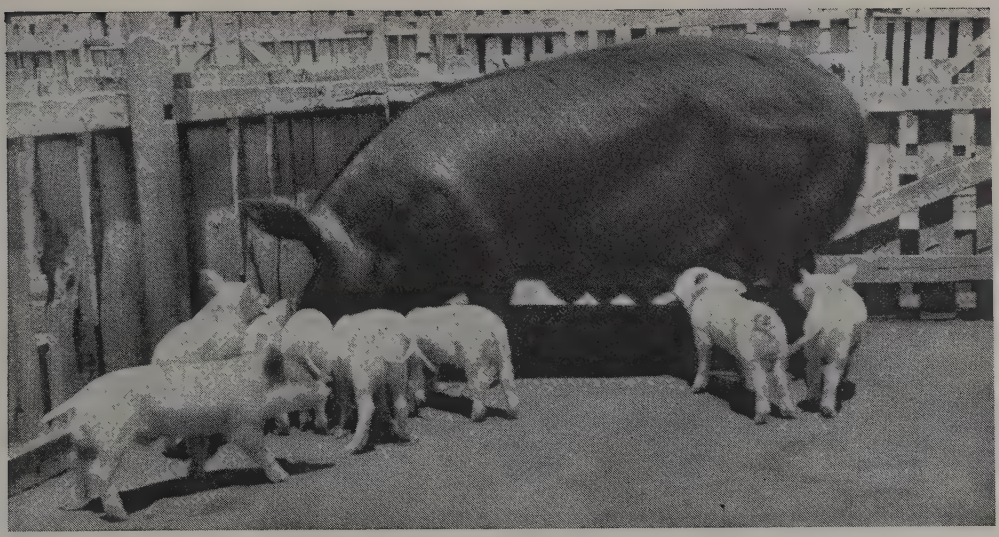


Selection for prolificacy, coupled with sound management, will give nine or more pigs weaned per litter. More pigs marketed per sow, per year, mean reduced weaner costs and increased profits.

PREVENTING PIG LOSSES

By K. M. HOPE, B.Sc. (Agric.), Agricultural Adviser.

ONE of the main sources of economic loss in the pig industry is the high degree of mortality in young pigs. A study of the four pig crop reports from December, 1951, to June, 1953, shows that no less than 22 per cent. of the average litter of 8.8 pigs in Western Australia were lost before reaching the weaner stage.

These losses represent a heavy impost on the industry which could be reduced considerably by sound management. Reduced losses would mean that more pigs could be marketed per sow per year and this output figure could be further increased by intensive selection of high-producing sows which farrow and rear more pigs in a year.

The losses of young pigs may be grouped under three headings:

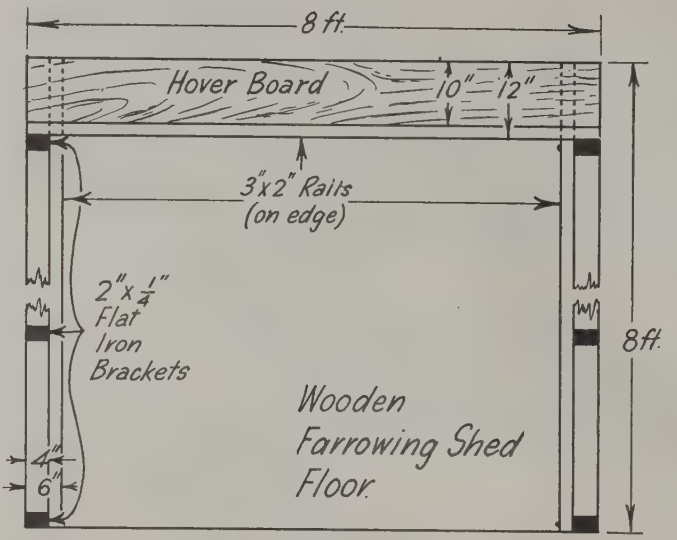
1. Pigs born dead.
2. Pigs born alive but lost before weaning due to crushing (overlying), scours, malnutrition and other causes.
3. Pigs lost after weaning.

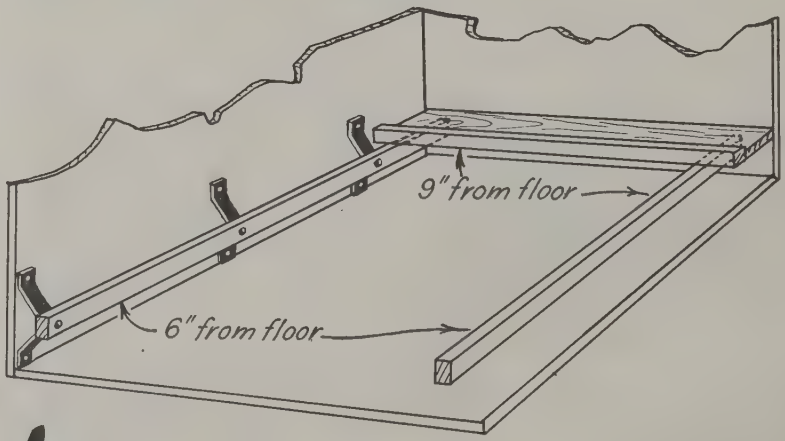
PIGS BORN DEAD

About one dead pig in every 20 pigs born can be regarded as a normal result of the reproductive physiology of the sow. As many as 20 to 30 ova may be fertilised, although only 7 to 14 pigs generally survive the full 16 weeks of the gestation period owing to the intense competition for the nutrients in the uterine blood supply.

To obtain good litters the boar should be healthy and vigorous and should receive the same high quality feed as the in-pig sow, but with the quantity fed daily cut down to 4 to 5 lb., so as to keep him in light working trim. A service on the first day of heat plus another service on the second day of heat is recommended. If the boar must be used sparingly a single service would best be given on the second day of heat. Sows should not be run with the boar for any length of time as he will take most of the feed, will become too heavy and may also cause pig losses by jostling in-pig sows.

Sound nutrition of the in-pig sow will minimise the number of pigs born dead





A Combined { HOVER BOARD FARROWING RAIL

and improve the total number of pigs born. A ration of 16 per cent. crude protein content is recommended for in-pig sows and the quantity fed daily (5 to 6 lb.) should be adjusted to keep the sows in good condition but not too heavy. The crushed grain ration for in-pig sows and boars could contain a large proportion of barley and oats as the extra bulk will keep them contented without making them over-fat.

In-pig sows use green grazing more efficiently than any other pigs, and this gives a saving of approximately half the protein supplement and half the grain ration. A sow on unlimited green grazing, plus 6 oz. meatmeal and 2¼ lb. crushed grain per day, would do as well as a sow receiving 12 oz. meatmeal and 4½ lb. crushed grain with no grazing. In addition, the sows on good grazing would be in better "nick" with improved muscular tone.

Sudden changes in the feed should be avoided during pregnancy as the sow may go off her feed for several days when switched to a different ration, and the resulting competition between the developing embryos for the reduced supply of nutrients could result in smaller litters being born, more runts, or occasional dead pigs. A serious cause of dead pigs is slow farrowing and this may be due to several factors, some of which may be eliminated by improved management. Most of the still-born, well-developed piglets are in effect suffocated while being born as they are derived of the maternal blood supply for too long before the actual emergence when they can take in their own oxygen by breathing.

Still-born pigs may be caused by the following conditions, all of which may be prevented:—

1. Sow in too heavy condition. This may be prevented by raising the quality and reducing quantity of feed during pregnancy.

2. Old and gross sows. Preventive measures here consist of culling the sows after five litters, except for the unusually good sow that continues to farrow successfully and rear good litters.

3. Poor muscular tone of the uterus and allied muscles due to a ration deficient in proteins and vitamins. This may be prevented by improved feeding.

4. Constipation. To prevent this include 25 per cent. of bran in the ration of the sow during the week before farrowing.

PIGS BORN ALIVE BUT LOST BEFORE WEANING

Most of the losses under this heading are due to crushing (overlying) and this may be reduced by keeping the sows in good condition; culling sows before they become too heavy and clumsy; using a good farrowing pen, and controlling the sows' rations during the first two days when the newly-born pigs are most vulnerable.

Sows should not be fed for 24 hours after farrowing although fresh clean water should be freely available. If the sow is fed soon after farrowing is completed, she is liable to become sluggish, clumsy and sleepy and is more liable to crush her pigs. On the second day after farrowing two light feeds of wet mash are recommended, following which the feed should be gradually increased to provide all that the sow can eat by the end of the first week.

A ration of 17 to 18 per cent. crude protein content is recommended for sows suckling a litter. This promotes an ample flow of milk with the minimum of loss in body weight of the sow over the eight weeks. A good guide for the daily feeding is 6 to 7 lb. for the sow herself plus a ½ lb. per piglet being suckled; i.e., a sow with ten pigs would receive 11 to 12 lb. of feed daily. This quantity of feed would be reduced on the day before weaning so as to ease off the milk supply and prevent discomfort.

Losses by crushing are considerably reduced by the combined hover board and farrowing rail which is built 10 to 12 inches out from the wall and 8 to 10 inches up from the floor. The hover board provides a snug shelter which is out of the way of the sow and it is equally effective with either flat or sloping floors as the cosiness of the hover attracts the young pigs. Where there is an outside concrete pen, the exit from the wooden-floored farrowing pen should be blocked so as to avoid any losses from new-born piglets being chilled on the concrete.

Attention to sows at farrowing time pays good dividends in reduced pig losses. This is especially the case if a sow has become lame or unexpectedly clumsy in the last month of pregnancy. A well-designed farrowing crate can be of considerable assistance with such sows.

Farmers who handle their sows on a bulk basis are advised to reduce losses from diseases by providing at least four paddocks of two to ten acres in area which can be rested in turn, preferably under some form of crop to use up the pig manure and freshen up the ground.

These miniature runs at the back of the farrowing pens are a useful alternative when limited areas do not allow of sow and litter paddocks.

Farrowing pen hygiene is the first step in minimising losses from scours, worms and other disease conditions. The farrowing pen should be scrubbed out and disinfected before bringing a new sow, while the sow herself should be groomed down so that the newly born piglets will not suck worm eggs and disease producing organisms from the udder surface.

The sow and litter should be moved out from the farrowing pen to a paddock by the end of the first week. If they must remain in pens they should have only small paved yards for the sow and the space saved would be used to provide miniature paddocks for the litter only, at the back of the pen.

Losses of young pigs from malnutrition both before and after weaning will be minimised by creep feeding them from three to eight weeks with a dry meal mixture of 17 to 18 per cent. protein content. Dry meal is recommended as it can be always available without the souring or fermenting that would occur with wet feed.

LOSSES AFTER WEANING

The pig crop report for the spring of 1952 showed that 3.6 per cent. of pigs were lost after weaning. These losses could be considerably reduced by improved feeding, cleaner pens and cleaner paddocks.

Losses from castration could be practically eliminated if this operation is carried out hygienically before the pigs are six weeks old. If castration is carried out early and the piglets are creep fed from three to eight weeks, and then the litters are weaned by removing the sow from the piglets so that the young pigs are left in familiar surroundings, it should be possible to produce weaners weighing 35 lb. and over. Such pigs would not have received any setbacks and would grow well to porker weights at three to four months and baconer weights at six months.

Good feeding, with protein levels of 17 to 18 per cent. for weaners, 16 per cent. for slips and growers, 14 per cent. for porkers and 13 per cent. for baconers would give keen, healthy, actively-growing pigs which would be resistant to disease.

If pneumonia, paratyphoid or other diseases occur, prompt isolation and treatment will minimise losses.

When necessary, a routine dosage with sodium fluoride for control of roundworms would be best given about two weeks after weaning.

A SIMPLE DOCKAGE-TESTER

By G. L. SUTTON

IN Part 3 of my article "The Basic Principles of Wheat Marketing"*, I gave a brief description of an Australian-made instrument for rapidly ascertaining the percentage of "dockage" or unmillable material contained in a sample of commercial wheat. I feel that this dockage-tester is so simple in operation and so convenient to use that it warrants a more detailed description.

The instrument is simple in design and is suitable for use at the silo, bulk bin, flourmill or warehouse. The percentage of unmillable material in a sample of commercial grain may, by the use of this dockage-tester, be quickly ascertained even by operators not familiar with the use of a laboratory balance and unaccustomed to calculating percentages.

By using a large token weight representing 500 grammes with smaller tokens representing 5, 10, 15 and 20 grammes and numbered respectively 1, 2, 3 and 4, the dockage-tester becomes practically self-calculating.

THE METAL TRAY

This is the main feature of the instrument and full details are given to facilitate manufacture by a metal-worker. The tray consists of four sides and a central partition or support, all constructed from 14-gauge sheet iron. The floor of the tray is a grid constructed of $\frac{1}{4}$ in. round steel rods with spaces between them forming a screen through which unmillable material such as weed seeds, cracked grain, sand, etc., can fall while the millable grain remains above the grid.

The inside measurements of the metal tray are as follows:—Width, 8 934/1,000 in.; length (front to rear), $8\frac{3}{4}$ in.; vertical overall depth, $2\frac{1}{4}$ in.

The front and rear ends are $1\frac{3}{4}$ in. deep by 8 934/1,000 in. long and their top edges are level with the sides of the tray. The sides are the full $2\frac{1}{4}$ in. deep and $10\frac{3}{8}$ in. long with $\frac{3}{4}$ in. turned at right angles at each end and welded to the front and rear portions.

The central support is a strip of 14-gauge sheet iron 8 934/1,000 in. long and $1\frac{1}{8}$ in. deep. It is welded in position centrally as shown at A in the plan (Fig. 1) with its lower edge level with the lower edges of the sides.

The Grid Screen.

The grid screen consists of 27 steel rods which are of $\frac{1}{4}$ in. diameter and $8\frac{7}{8}$ in. in length. The holes through which the rods fit are drilled in the ends and the central support at 328/1,000 in. (centres) apart with the first and last holes 203/1,000 in. (centres) from their respective sides.

The line of the centres is $1\frac{3}{8}$ in. from the top of the front and rear ends of the tray and $\frac{1}{4}$ in. from the upper edge of the central support partition.

The rods are 78/1,000 in. (2 millimetres) apart and thus the spaces between them correspond with the spaces in the winnowing screens used by flourmillers to separate the millable wheat from the associated unmillable material.

The extra depth of the side pieces permits them to be slotted as shown in the

* The Journal of Agriculture of Western Australia, Vol. 2 (Third Series) Number 6, page 725. November-December 1953.

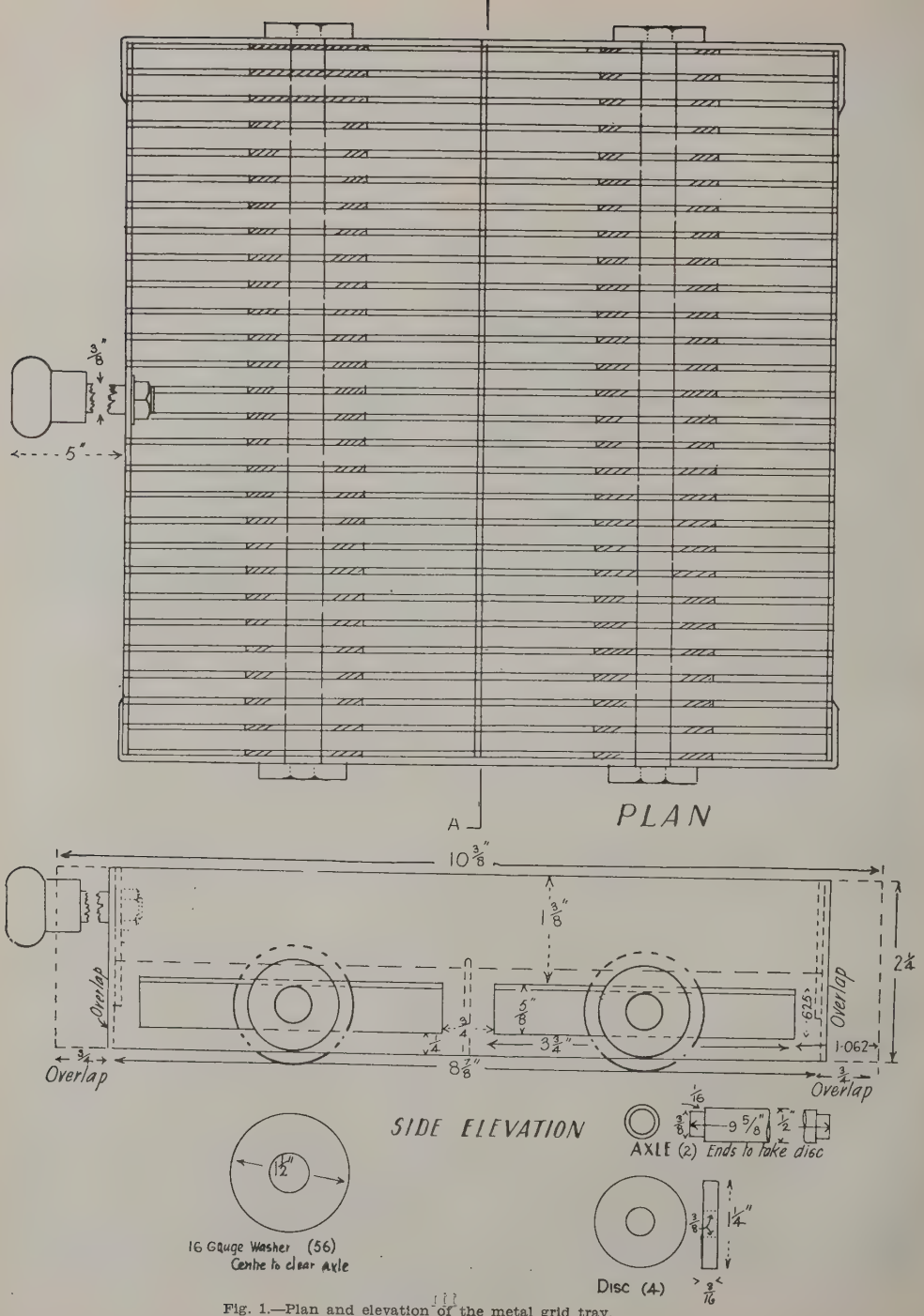


Fig. 1.—Plan and elevation of the metal grid tray.

side elevation (Fig. 1). Each side carries two slots which are $\frac{5}{8}$ in. wide and $3\frac{3}{4}$ in. long with a $\frac{3}{4}$ in. division between them.

Two round steel rods $9\frac{5}{8}$ in. long and 7/16 in. diameter pass through the slots from side to side so that they are below, and at right angles to the grid screen rods. Each of these transverse rods serves as an axle or spindle upon which 28 iron washers (corresponding with the spaces between the grid screen) are loosely mounted. These washers are $1\frac{1}{2}$ in. in diameter with $\frac{1}{2}$ in. holes and they are made from 16-gauge metal. With the spindles in position below the grid, the upper edges of the washers project slightly through the spaces between the grid rods.

The spindles are shouldered at each end to $\frac{3}{8}$ in., and on the shoulder is rivetted a fixed disc of $1\frac{1}{4}$ in. diameter and 3/16 in. thickness. These discs fit into recesses on the inside of the wooden box which encloses the tray, and rest on the hardwood runners on which the tray slides to and fro when actuated by the handle.

The handle is $\frac{3}{8}$ in. diameter brass rod, shouldered to $\frac{1}{4}$ in. at one end and threaded to bolt to the front of the tray which is drilled to receive it.

THE WOODEN BOX

The box which serves as a container for the tray is made from softwood dressed to $\frac{1}{2}$ in. thickness. The inside measurements of the box are:—Length (front and rear), $12\frac{5}{8}$ in.; width, $9\frac{5}{8}$ in.; depth, 4 in.

Two hardwood runners made from timber $\frac{3}{4}$ in. wide and $\frac{3}{8}$ in. thick are screwed and glued inside the box and the tray rests on these with its upper edges just below the upper edges of the box. The recesses for the discs on the end of the washer spindles are made by glueing and screwing three pieces of plywood to each side of the box above the hardwood runners. Pieces of 3/16 in. plywood $2\frac{3}{4}$ in. wide are used. The centre pieces are $3\frac{1}{4}$ in. long and the end pieces $3\frac{1}{2}$ in. long.

Below the runner is a shallow drawer to receive the dockage or unmillable material which falls through the spaces in the grid. At the top of the box above the drawer handle a small groove is cut in the front end of the box to allow the tray handle to protrude.

METHOD OF OPERATING

To operate the dockage-tester, the tray is placed in position in the box and a quantity of commercial wheat (previously

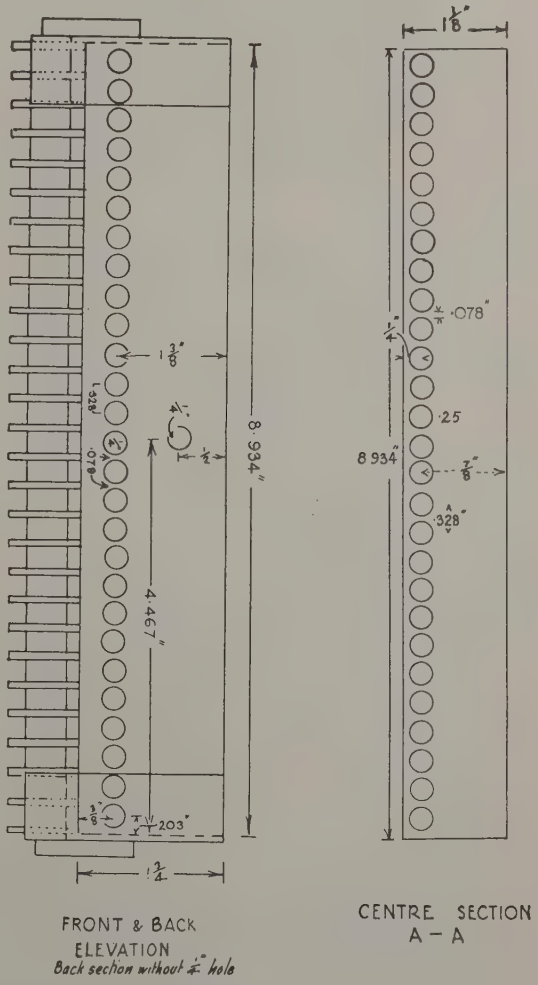


Fig. 2.—Front, back and centre elevation of metal grid tray.

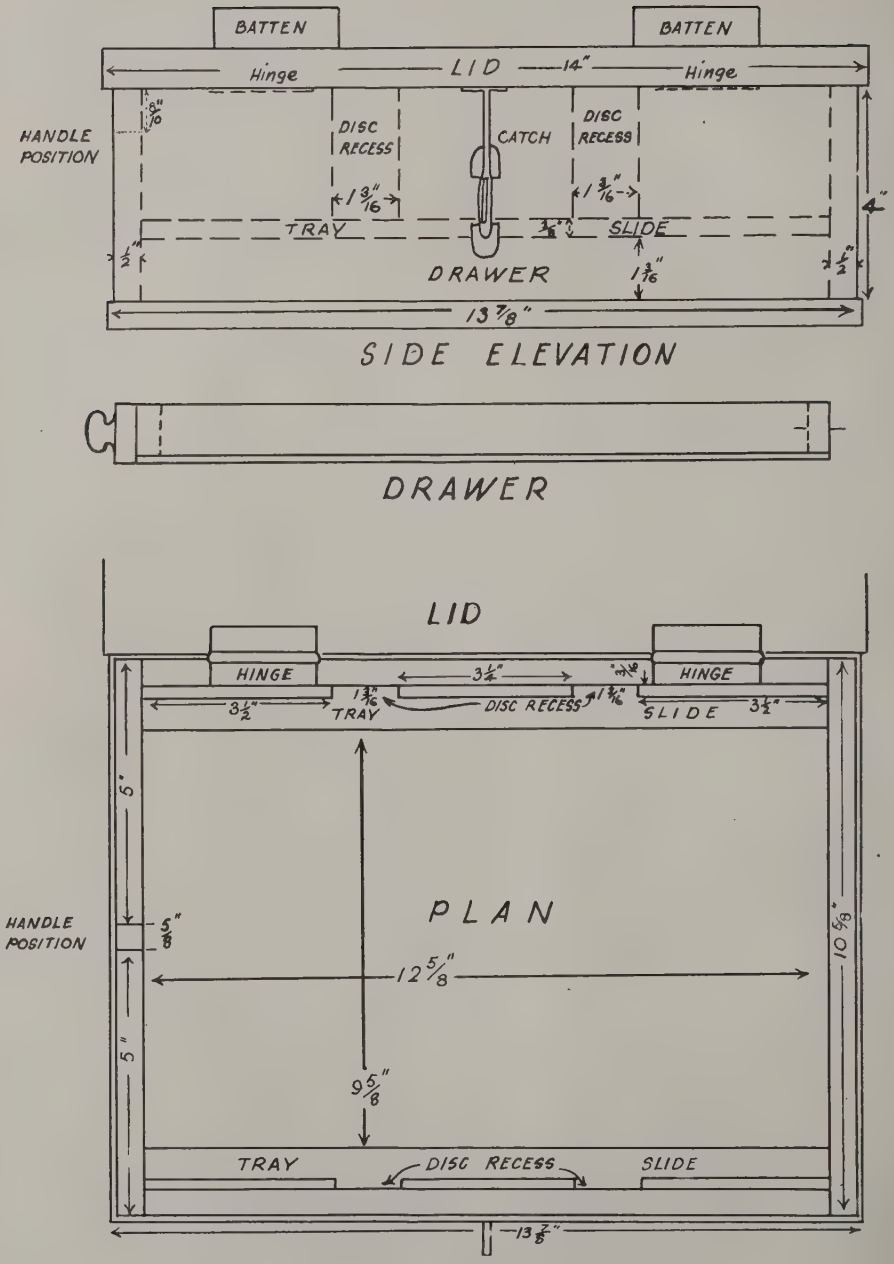


Fig. 3.—Plan and side elevation of wooden box.

weighed with a token weight representing 500 grammes) is tipped into the tray.

The box is closed and the handle of the tray is pulled out to its full length and pushed back as far as possible. This operation is repeated a standard number of times (say 25 times with each sample).

The movements of the handle cause the grid-bottomed tray to slide backward and forward, but the spindles carrying the washers remain stationary, being held by the recesses. The washers thus help to keep the spaces between the grid bars clear.

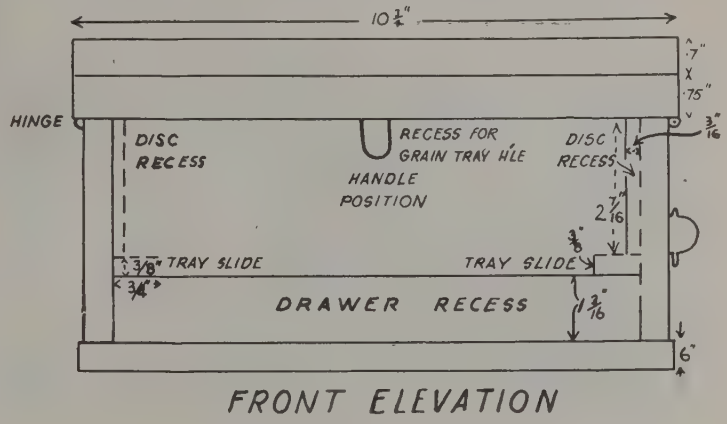


Fig. 4.—Front elevation of wooden box.

Weed seeds, sand, cracked or shrivelled grain, small pieces of straw and any substances that pass through the spaces in the grid, fall into the drawer.

Clean plump grain and any material too large to pass through the grid will remain above the bars in the tray. Any large pieces of straw, backbone, etc., too large to pass through the grid may be picked out by hand without difficulty and added to the material in the drawer.

This unmillable material is then removed from the drawer and weighed on a balance using token weights representing 5, 10, 15 and 20 grammes and numbered respectively 1, 2, 3 and 4.

The total of the numbers on the tokens used to balance the dockage will give the percentage of unmillable material of the sample. For example, if the material requires the tokens numbered 2 and 3 to balance it, the percentage of dockage in the sample will be 5%. Similarly, if numbers 1 and 2 tokens were used, the percentage would be 3%.

Instead of scales, a chondrometer could be used in the following manner. Sufficient grain is placed in the bucket to balance with the indicator at the 50 lb. mark on the bar. After being treated in the dockage tester the unmillable material is placed in the empty bucket and the balancing counter-poise added. Every ½ lb. registered on the bar then represents 1% of unmillable material in the sample.

FARMERS

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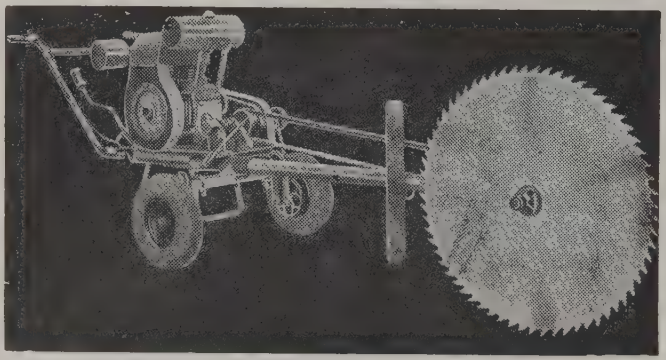

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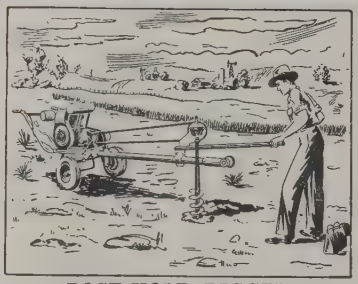

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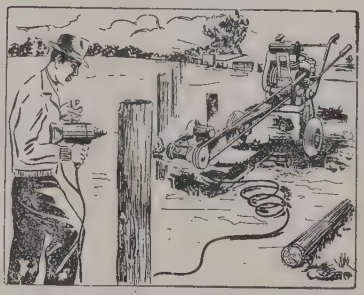

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FERTILISERS

ALL fertilisers sold in Western Australia are required to be registered annually with the Department of Agriculture. A list of those fertilisers registered for the current registration year which commenced on the 1st November, 1953, appears in this issue.

In addition to registration, manufacturers and sellers of fertilisers must fulfil certain other requirements of the Fertiliser Act, 1928. All fertilisers sold must be contained in a package on which is clearly marked the registered brand and name of the fertiliser and if the quantity of a fertiliser sold is 1 cwt. or more, an invoice setting out the registered brand and name together with the registered analysis of the fertilised must be supplied to the buyer.

Persons buying fertilisers are strongly advised to consult the list of registered fertilisers and to see that packages are correctly branded and when applicable, invoiced before accepting delivery of any fertiliser.

If a fertiliser which is offered for sale, is not included in the list of registered fertilisers, or if any other doubts arise, prospective buyers are advised to make enquiries at the Department of Agriculture before purchasing such material.

Departmental inspectors carry out periodical inspections of places where fertilisers are held for sale. Samples are taken and submitted to the Government Analyst for analysis to see that fertilisers being sold comply with the registered analysis. The knowledge that this work is being carried out, induces manufacturers to maintain their fertilisers close to and usually a little above the registered standard.

UNIT VALUES

From the list of registered fertilisers, unit values for the main fertilising ingredients, nitrogen, phosphoric acid and potash in their various forms have been calculated and are as follows:—

	s.	d.
Nitrogen (N) as—		
Blood and Bone, Bonedust and other animal fertilisers	72	2
Nitrate	47	0
Ammonia	37	5
Phosphoric Acid (P_2O_5) as—		
Water soluble in superphosphate	13	8
Citrate soluble in superphosphate	13	8
Acid soluble in superphosphate and rock phosphate	6	3
Dried Blood, Blood and Bone, Bonedust and other animal fertilisers	18	0
Potash (K_2O) as—		
Sulphate	16	11½
Muriate (Chloride)	12	3

The unit value for a given fertiliser ingredient is the average commercial value of each one per cent. of that ingredient per ton of fertiliser. The values listed above have been calculated from the average quoted prices at the time of registration.

From unit values the relative commercial values of fertilisers can easily be calculated. Multiply the percentage of each ingredient in the fertilisers by their unit values and total the result for all ingredients in each fertiliser, e.g.:—

	Minimum percentage of— Nitrogen	Phosphoric Acid
X Brand Blood and Bone	6.5	10.0
Y Brand Blood and Bone	5.5	13.0

From the table of unit values above, it will be noted that the unit values for Nitrogen and Phosphoric Acid in Blood and Bone are 72s. 2d. and 18s. respectively. From these figures the comparative values of each fertiliser can be calculated as follows:—

X Brand Blood and Bone

	s.	d.
6.5 units of nitrogen @ 72s. 2d. per unit	469	1
10.0 units of phosphoric acid @ 18s. per unit	180	0
Total value	649	1

Y Brand Blood and Bone

5.5 units of nitrogen @ 72s. 2d. per unit	396	11
13.0 units of phosphoric acid @ 18s. per unit	234	0
	630	11

It can readily be seen that the units contained in X Brand are worth more than those in Y Brand. Therefore, if both fertilisers were offered at the same price, the X Brand would be the most economical to purchase.

Unit values are only useful for a comparison of fertilisers of similar types. It will be appreciated that it is not possible to compare, say for example, the nitrogen in blood and bone with that in sulphate of ammonia.

When using unit values to calculate the commercial values of fertilisers, it should be borne in mind that these values are average figures calculated from all fertilisers registered. It will therefore be found that values arrived at from the use of unit values will, in some cases, be more than and in some cases less than the actual selling price. It should also be remembered that market values fluctuate and that in the case of mixed fertilisers, e.g., potato manures, the cost of mixing and extra handling, must be added to figures arrived at by the use of unit values.

FARMERS HAVE PROVED . . .
K F M
defeats Flystrike
1 Gallon MAKES SIX
Australian farmers and station owners buy more K.F.M. than any other brand. Why? Because K.F.M. emulsion has been tried and proven over the years. K.F.M. is both a cure and preventive of Blowfly strike. Flies resting on a K.F.M. treated area absorb sufficient D.D.T. through the pads of their feet in a few seconds to ensure certain death.
From your local AGENT or
WILCOX MOFFLIN LTD.
SOUTH TERRACE, FREMANTLE
1 Gallon of K.F.M. emulsion makes 6 gallons of working mixture.

FERTILISERS

The following Fertilisers have been registered at the Department of Agriculture under the Fertiliser Act, 1928, for the year commencing 1st November, 1953

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
A.—MINERAL.														
1. Nitrogenous.														
(a) *Nitrogen as Nitrate.*														
Chilean Nitrate of Soda	7	Champion	R. Dundas Smith & Son	16·0	....	....	....	....	....	....	....	....	....	£35/12/6 ex Ship.
Sodium Nitrate	8	Faulding's	F. H. Faulding & Co., Ltd.	16·0	....	....	....	....	....	....	....	....	....	£9/6/6 per cwt. (P)
Nitrate of Soda	19	Boans	Boans, Ltd.	16·0	....	....	....	....	....	....	....	....	....	£38/7/0 (W) P.
Do.	37	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	15·5	....	....	....	....	....	....	....	....	....	£39/0/3 (W) B.
(b) *Nitrogen as Ammonia.*														
Ammonium Nitrate	9	Faulding's	F. H. Faulding & Co., Ltd.	30·0	....	....	....	....	....	....	....	....	....	£7/19/0 per cwt. (P)
Sulphate of Ammonia	10	do.	do. do. do.	....	20·0	....	....	....	....	....	....	....	....	£2/12/0 per cwt. (P)
Do. do.	20	Boans	Boans, Ltd.	....	20·5	....	....	....	....	....	....	....	....	£4/14/6 per bag (187 lb.), 4/0 per 7lb. packet
Do. do.	38	I, C, I, A, N, Z	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	20·5	....	....	....	....	....	....	....	....	£38/7/0 (W) P £39/15/7 (W) G £39/0/3 (W) B 3/6 per 7lb packet
Do. do.	112	David Gray's	David Gray & Co., Ltd.	....	21·0	....	....	....	....	....	....	....	....	3/6 per 7lb. packet
Do. do.	121	Wrights	Wrights, Ltd.	....	20·5	....	....	....	....	....	....	....	....	
(c) *Nitrogen as Urea.*														
Nitro 46	111	Flak	A. A. Schaffer & Co. Pty., Ltd.	....	46·0*	....	....	....	....	....	....	....	....	3/9 per lb.
Nitrogen Fertiliser	133	Grofast	Commercial Chemical Co.	....	45·0†	....	....	....	....	....	....	....	....	4/6 per 1lb. packet
2. Phosphatic.														
(a) *Rock Phosphate.*														
Ground Phosphatic Rock	39	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertiliers, Ltd.	....	....	....	....	....	....	36·6	36·6	....	....	£11/8/0 (W)
Do. do. do.	40	Sickle	do. do. do.	....	....	....	....	....	....	36·6	36·8	....	....	£11/8/0 (W)
(b) *Superphosphate.*														
Superphosphate	21	Boans	Boans, Ltd.	....	....	....	....	17·0	2·0	4·0	23·0	....	....	£14/4/3 (W)
Do.	41	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers	....	....	....	....	17·0	2·0	4·0	23·0	....	....	£14/4/3 (W)
Do.	42	Mount Lyell as ML in diamond	do. do. do.	....	....	....	....	17·0	2·0	4·0	23·0	....	....	£14/4/3 (W)
Florida Super	43	Sickle	do. do. do.	....	....	....	....	17·0	2·0	4·0	23·0	....	....	£14/4/3 (W)
Super	81	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	....	....	....	17·0	2·0	4·0	23·0	....	....	
Superphosphate	122	Wrights	Wrights, Ltd.	....	....	....	....	17·0	2·0	4·0	23·0	....	....	
D.D.T. Superphosphate	127	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	D.D.T. 0·5	16·0	2·0	3·75	21·75	....	....	£22/8/1 (W)
Do. do.	128	Sickle	do. do. do.	....	....	....	0·5	16·0	2·0	3·75	21·75	....	....	£22/8/1 (W)
(c) *Rock Phosphate and Superphosphate.*														
50/50 Mixture	44	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	8·5	1·0	20·5	30·0	....	....	£13/13/7 (W)
Do.	45	Mount Lyell as ML in diamond	do. do. do.	....	....	....	....	8·5	1·0	20·5	30·0	....	....	£13/13/7 (W)

P denotes Perth. G denotes Geraldton. B denotes Bunbury. * Potash as Nitrate. † Nitrogen as Urea.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
50/50 Mixture	82	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	....	....	....	8·5	1·0	20·5	30·0	....	....	£13/13/7 (W)
(d) *Superphosphate and Minor Elements.*														
Super and Copper No. 1	46	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	...	Copper 1·25	16·0	1·75	3·75	21·5	....	....	£21/8/11 (W)
Super and Copper Ore	47	do.	do. do. do.	....	....	.... Zinc	1·0	13·0	2·0	4·0	19·0	....	....	£16/9/3 (W)
Super and Zinc	48	do.	do. do. do.	....	....	2·5	....	16·0	1·75	3·75	21·5	....	....	£18/8/9 (W)
Super and Zinc No. 2	49	do.	do. do. do.	....	....	1·15	....	16·5	1·75	4·25	22·5	....	....	£16/8/9 (W)
Super, Copper Ore and Zinc	50	do.	do. do. do.	....	....	1·15	1·0	13·75	1·5	3·25	18·5	....	....	£17/16/2 (W)
Super and Manganese	51	do.	do. do. do.	....	Manganese 3·8	....	....	14·5	1·75	3·25	19·5	....	....	£24/1/1 (W)
Super and Copper Ore	52	Sickle	do. do. do.	....	....	....	1·0	13·0	2·0	4·0	19·0	....	....	£16/9/3 (W)
Super and Zinc No. 2	53	do.	do. do. do.	....	....	1·15	..	16·5	1·75	4·25	22·5	....	....	£16/8/9 (W)
Super, Copper Ore and Zinc	54	do.	do. do. do.	....	....	1·15	1·0	13·75	1·5	3·25	18·5	....	....	£17/16/2 (W)
Super and Manganese	55	do.	do. do. do.	....	3·8	....	....	14·5	1·75	3·25	19·5	....	....	£24/1/1 (W)
Super and Copper Sulphate	83	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	....	....	1·25	16·0	1·75	3·75	21·5	....	....	£21/8/11 (W)
Super and Copper Ore No. 2	84	do.	do. do. do. ..	....	....	....	1·0	13·0	2·0	4·0	19·0	....	....	£16/9/3 (W)
Super and Zinc Sulphate	85	do.	do. do. do.	....	....	0·8	....	16·25	2·0	3·75	22·0	....	....	£18/7/7 (W)
Super and Zinc Oxide No. 2	86	do.	do. do. do.	....	....	1·15	....	16·5	1·75	4·25	22·5	....	....	£16/8/9 (W)
Super, Copper Ore and Zinc Oxide	87	do.	do. do. do.	....	....	1·15	1·0	13·75	1·5	3·25	18·5	....	....	£17/6/2 (W)
Super and Manganese	88	do.	do. do. do.	....	3·8	....	....	14·5	1·75	3·25	19·5	....	....	£24/1/1 (W)
Super and Molybdenum	89	do.	do. do. do.	Molybdenum Trace	....	....	....	17·0	2·0	4·0	23·0	....	....	£17/13/1 (W)
Super and Minor Elements	90	do.	do. do. do.	....	2·25	2·25 Zinc.	0·8 Copper.	12·25	1·5	2·75	16·5	....	....	£24/4/2 (W)
Super, Copper Mixture, and Zinc Oxide	129	do.	do. do. do.	....	....	1·15	1·0	13·75	1·5	3·25	18·5	....	....	£19/8/9 (W)
Super and Copper Mixture	130	do.	do. do. do.	....	....	....	1·0	13·0	2·0	4·0	19·0	....	....	£18/1/10 (W)
Super, Copper Mixture, and Zinc	131	Sickle	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	1·15	1·0	13·75	1·5	3·25	18·5	....	....	£19/8/9 (W)
Super and Copper Mixture	132	do.	do. do. do.	....	....	....	1·0	13·0	2·0	4·0	19·0	....	....	£18/1/10 (W)
3. Potassic. (a) *Potash as Sulphate.*														
Sulphate of Potash	22	Boans	Boans, Ltd.	....	....	....	....	....	....	....	....	48·0	....	£40/13/6 (W) P
Do. do.	56	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	....	....	....	....	48·0	....	£42/5/0 (W) G £41 (W) B
(b) *Potash as Muriate.*														
Muriate of Potash	23	Boans	Boans, Ltd.	....	....	....	....	....	....	....	....	....	58·0	£4/4/0 per bag of 187lb.
Do. do.	57	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	....	....	....	....	....	58·0	£34/7/0 (W) P
Do. do.	116	Wesfarmers....	Westralian Farmers Co-op., Ltd.	....	....	....	....	....	....	....	....	....	54·0	£34/15/0 (W) B £34/7/6 (W) £34/17/6 (P)

4. Nitrogen and Phosphoric Acid.															
Lawn Manure	29	Dawn	Dawn Fertilisers	....	8·54	....	....	9·23	1·36	0·82	11·4	....	....		
Plant Food	30	do.	do. do.	....	5·23	....	....	11·21	1·41	1·46	14·8	....	....		
Potato Manure C	58	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	3·5	....	....	14·0	1·5	3·25	18·75	....	....	{	£20/8/0 (W) B £20/5/4 (W) B
Do. do.	59	Mount Lyell as ML in diamond	do. do. do.	....	3·5	....	....	14·0	1·5	3·25	18·75	....	....		£20/3/0 (W)
Do.	60	Sickle	do. do. do.	....	3·5	....	....	14·0	1·5	3·25	18·75	....	....		£20/3/0 (W)
Do.	91	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	3·5	....	....	14·0	1·5	3·25	18·75	....	....		
Lawn Manure	123	Wrights	Wrights, Ltd.	....	3·5	....	....	14·0	1·5	3·25	18·75	....	....		
5. Nitrogen, Phosphoric Acid and Potash.															
Potato Manure A	24	Boans	Boans, Ltd.	....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0		£2/1/6 per bag of 160lb.
Potato Manure E	25	do.	do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£2/9/0 per bag of 160lb.
Potato Manure A	61	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0		£20/19/0 (W)
Potato Manure A2	62	do.	do. do. do.	....	2·5	....	....	13·25	1·5	3·25	18·0	5·0	....		£22/7/6 (W)
Potato Manure B	63	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/5/9 (W)
Potato Manure E	64	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/10/0 (W)
Potato Manure E2	65	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	8·0	....		£25/13/4 (W)
Orchard Manure	66	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/5/9 (W)
Tomato Manure	67	do.	do. do. do.	....	3·5	....	....	10·25	1·0	2·5	13·75	10·0	....		£27/1/10 (W)
Garden Fertiliser	68	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/10/0 (W)
Tobacco Fertiliser	69	do.	do. do. do.	3·3		....	....	11·5	1·25	3·0	15·75	5·7	....		£24/18/9 (W)
Tobacco Fertiliser No. 2	70	do.	do. do. do.	3·3		Zinc Trace	Copper Trace	11·0	1·25	2·75	15·0	5·7	....		£25/4/3 (W)
Potato Manure A	71	Mount Lyell as ML in diamond	do. do. do.	....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0		£20/16/8 (W)
Potato Manure B	72	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/2/9 (W)
Potato Manure E	73	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/6/7 (W)
Orchard Manure	74	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/2/9 (W)
Garden Fertiliser	75	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/6/7 (W)
Potato Manure A	76	Sickle	do. do. do.	....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0		£20/16/8 (W)
Potato Manure B	77	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/2/9 (W)
Potato Manure E	78	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/6/7 (W)
Orchard Manure	79	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	....	5·0		£22/2/9 (W)
Garden Fertiliser	80	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0		£23/6/7 (W)
Potato Manure A	92	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	2·5	....	....	13·25	1·5	3·25	18·0	5·0	....		£20/16/8 (W)
Potato Manure B	93	do.	do. do. do.	....	3·5	....	....	12·5	1·25	3·0	16·75	5·0	....		£22/2/9 (W)
Potato Manure E	94	do.	do. do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	8·0	....		£23/6/7 (W)
Orchard Manure	95	do.	do. do. do.	3·5	....	....	....	12·5	1·25	3·0	16·75	5·0	....		£22/3/9 (W)
Potato Manure A	124	Wrights	Wrights, Ltd.	....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0		
6. Liquid Fertiliser.						*Minor Elements.*									
Liquid Manure	6	Keoghs	Wilcox, Mofflin, Ltd.	1·7		Magnesium, Boron, Manganese, Molybdenum, Zinc, Copper		1·5	....	....	1·5	....	2·0		3/11 per 20oz. bottle (wholesale)
Do.	11	Fauldings	F. H. Faulding & Co., Ltd.	7·5		....	....	5·0	....	....	5·0	3·5*	....		
Liquid Fertiliser	12	Blue Peter	Agricultural Products Co.	7·5		....	....	5·3	....	....	5·3	....	3·7		3/6 per 20oz. bottle
Do.	113	David Gray's	David Gray & Co., Ltd.	9·0		....	....	6·0	....	....	6·0	....	4·0*		2/6 per 20oz. bottle
Hypon Q	125	Hypon	Hydroponics Pty., Ltd.	....	4·0	....	....	5·0	....	....	5·0	....	4·0		1/6 per 20oz. bottle
Liquid Manure	134	Rapid Gro	Commercial Chemical Co.	....	14·0	....	....	....	....	....	....	12·0*	....		4/11 per 1lb. packet
Hylawn (1)	126	Hypon	Hydroponics Pty., Ltd.	....	16·0	....	....	50·0	....	....	50·0	....	20·0		
7. Miscellaneous.															
Bulb and Corm Manure	32	Dawn	Dawn Fertilisers	....	1·9	....	....	9·2	1·4	0·8	11·4	....	9·0		
Seedling Manure	33	do.	do. do.	....	5·3	....	....	8·75	1·25	1·0	11·0	....	4·4		
Fertiliser	99	Clarksons	Clarksons (W.A.) Pty., Ltd.	....	5·6	....	....	5·5	....	0·43	5·93	....	3·2		4/3 per 7lb. packet
Rose Manure	100	do.	do. do. do.	....	5·6	....	....	5·5	....	0·43	5·93	....	3·2		4/3 per 7lb. packet
Growth Fertilizer Tablets	110	Summit	L. M. McLeod	....	4·1	....	....	7·0	1·2	0·1	8·3	....	12·2		
Powdered Fertiliser	114	David Gray's	David Gray & Co., Ltd.	5·6		....	....	5·5	....	0·43	5·93	....	3·2*		2/11¾ per 7lb. packet
Rose Manure	115	do.	do. do. do.	5·6		....	....	5·5	....	0·43	5 93	....	3·2*		3/1½ per 7lb. packet

* Potash as Nitrate.

P denotes Perth. G denotes Geraldton. B denotes Bunbury.

FERTILISERS—*continued.*

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
B.—ORGANIC.														
(a) *Blood and Bone.*														
Blood and Bone	1	Pannifex	Burridge & Warren Pty., Ltd.	....	....	7·0	....	....	5·0	5·0	10·0	....	....	£40 (P)
Do.	2	Wyndham	Wyndham Freezing, Canning & Meat Export Works	....	....	6·0	....	....	5·5	9·5	15·0	....	....	£30/14/3 (P)
5% N. Blood and Bone	3	Thomas	W. Thomas & Co. (W.A.), Ltd.	....	....	5·0	....	....	3·0	9·0	12·0	....	....	£36/10/0 (P)
Blood and Bone	4	TB and S in diamond	T. Borthwick & Sons (A'sia), Ltd.	....	....	5·75	....	....	6·75	5·25	12·0	....	....	£30 (W)
Blood and Bone Manure	5	Kitchens	J. Kitchen & Sons Pty., Ltd.	....	....	6·8	....	....	9·0	5·0	14·0	....	....	£37/7/6 (P)
Blood and Bone Fertiliser	13	Blue Cross	Agricultural Products Co.	....	....	5·0	....	....	6·5	6·5	13·0	....	....	3/9 per 7lb. packet
Blood and Bone	26	Boans	Boans, Ltd.	....	....	6·0	....	....	4·0	11·0	15·0	....	....	£1/2/6 per bag of 50lb.
Do.	96	Apex	E. J. Fry Pty., Ltd.	....	....	6·0	....	....	4·0	11·0	15·0	....	....	£34 10/0 (W) £35/5/0 (P)
Do.	118	Eclipse	The W.A. Meat Export Works	....	....	6·0	....	....	....	....	12·0	....	....	£27 (W)
(b) *Animal Fertiliser.*														
Animal Fertiliser	14	Blue Cross	Agricultural Products Co.	....	....	3·75	....	....	7·5	7·5	15·0	....	....	3/9 per 7lb. packet
Do.	36	K in diamond, A & A Surprise	C. A. Kirkby & Sons	....	....	5·0	....	....	4·0	10·0	14·0	....	....	£32/11/0 (P)
Do.	101	C.H.B.	C. H. Bailey	....	....	4·0	....	....	3·5	9·5	13·0	....	....	£26 (W)
Do.	103	Wooltana	Wooltana Industries, Ltd.	....	....	4·0	....	....	1·0	8·15	9·15	....	....	£26 (P)
Do.	106	Cloverdale	Cloverdale Fertilisers	....	....	4·0	....	....	....	....	16·0	....	....	£29 (W)
Whale Fertiliser	109	Wrights	Wrights, Ltd.	....	....	6·0	....	....	3·0	7·0	9·0	....	....	£34 (W)
Animal Fertiliser	120	Midland	The Midland Junction Abattoir Board	....	....	8·0	....	....	....	....	5·0	....	....	£20 (W)
(c) *Blood Meal Fertiliser.*														
Dried Blood	117	Wesfarmers	Westralian Farmers Co-op., Ltd.	....	....	12·0	....	....	....	....	....	....	....	£55 (W)
(d) *Fish Fertiliser.*														
Fish Fertiliser	135	Cormo	Nor-West Fertilisers	....	....	5·0	....	4·0	2·0	2·0	8·0	....	....	
(e) *Bone Dust Fertiliser.*														
Bone Dust	107	Cloverdale	Cloverdale Fertilisers	....	....	....	2·5	....	....	....	20·0	....	....	£18 (W)
(f) *Miscellaneous.*														
Special Garden Fertiliser	15	Blue Cross	Agricultural Products Co.	....		5·0		5·0	5·25	6·25	16·5	....	1·5	3/9 per 7lb. packet
Rose Bush Fertiliser	16	do.	do. do. do.	....		5·0		4·5	1·5	1·75	7·75	....	3·0	3/9 per 7lb. packet
Lawn Manure	17	do.	do. do. do.	....		3·35		5·0	5·0	6·0	16·0	....	2·0	3/9 per 7lb. packet
Special Mixed Rose Manure	27	Boans	Boans, Ltd.	....	....	3·0		....	....	....	14·0	....	9·0	12/8 per bag of 28lb.
Special Mixed Lawn Manure	28	do.	do.	....		5·0		....	....	....	15·0	....	....	£1/4/6 per bag of 56lb.
Rose Manure	31	Dawn	Dawn Fertilisers	....		5·9		10·3	1·52	0·91	12·7	....	1·64	
No. 1	34	Superhumus	do.	....		2·0		1·8	0·5	0·2	2·5	....	2·0	
No. 2	35	do.	do.	....		4·0		3·0	0·5	6·5	10·0	....	0·5	
No. 1 Fertiliser	97	Apex	E. J. Fry Pty., Ltd.	....		5·0		3·5	1·0	4·5	9·0	....	....	£33/10/0 (W) £34 (P)
Rose Manure	98	do.	do.	....		3·0		5·0	2·0	6·0	13·0	....	9·0	£37/10/0 (W) £38 (P)
Fertiliser	102	Sprout-em	Kag Manufacturing Co.	....	....	....	2·5	....	5·0	4·0	9·0	....	....	
No. 1	104	Wooltana	Wooltana Industries, Ltd.	....	....	....	3·0	....	....	13·0	13·0	....	....	£22/5/0 (P)
No. 2	105	do.	do. do. do.	....	....	....	2·0	2·0	....	9·0	11·0	....	....	£16 (W)
Organic Fertiliser	108	Wrights	Wrights, Ltd.	....	....	....	6·0	....	....	....	9·0	....	....	
Garden Fertiliser	119	Eclipse	The W.A. Meat Export Works	....	....	....	4·0	....	....	....	6·0	....	....	£25 (W)

P denotes Perth. G denotes Geraldton. B denotes Bunbury.

The Plant Quarantine display at the Perth Royal Show, 1953. This general view shows the demountable, third-dimensional aluminium stands together with some of the colourful posters used to emphasise the importance of the work.

PLANT QUARANTINE

Publicity Campaign Emphasises its Importance

ONE of the lesser-known activities of the Commonwealth Department of Health is the Plant Quarantine section which by its unobtrusive efforts has been able to safeguard Australian farms, orchards and gardens from many of the plant pests and diseases which have become serious scourges in other lands.

Unless constant vigilance is maintained at ports and airfields, infected plants or other materials could easily be introduced into Australia and result in the widespread dissemination of pests or diseases which could wipe out some of our primary industries unless they were controlled by costly campaigns.

In order to enlist the support and co-operation of the travelling public, and to give farmers a better understanding of the work that is being carried out, Plant Quarantine displays have recently been staged at the Royal Shows in all the capital cities of the Commonwealth.

These displays were designed to be readily demountable and the basic stands were made from half-inch hexagonal alloy rods in 30-inch lengths. The rods, joints and accessories were transported from city to city in a light three-ply box measuring 31in. x 12in. x 11in.

When assembled, the rods created third-dimensional space frames in which pictorial and other display material was suspended by means of fine wire. The illusion thus created of display pieces floating in space, especially when first seen from a distance, added to the eye-arresting appeal of the display.

As an aid to flexibility and mobility, in assembling a display plant to tour five capital city shows within three months, the exhibits were confined as far as possible to pests and diseases that have been kept out of Australia. Complementary support for this general national propaganda line was provided by the now

familiar "Don't be a Carrier" and "Will Your Baggage Pass the Test" posters of the campaign, which is sponsored by the Australian Agricultural Council. Photographs of quarantine inspections and examinations were also used.

Australia is most fortunate in being free from some of the world's worst pests and diseases of plants; so the organisers of this show display series had some interesting material to choose from. The exhibition subjects included:

Fire Blight of Apples and Pears—Ask any Australian apple grower if he would like to have "Fire Blight" in his orchard. He knows what a scourge it could be here, as it has been in North America and New Zealand, where it has wiped out apple and pear orchards and involved fruitgrowers in continuous expense to control it.

Citrus Canker—An authority has described Citrus Canker as the world's worst disease of citrus. In overseas countries, millions of trees have been destroyed by it and in measures to eradicate it. The disease is very difficult to control. America spent two and a half million dollars and destroyed four million trees to rid Florida and the Gulf States of Citrus Canker.

Boil Smut of Maize—Are you interested in growing maize or sweet corn? Australia is lucky in not having to contend with Boil Smut or with Stewart bacterial disease of these crops. Both of these scourges could be imported with maize or sweet corn.

Enemies of Potatoes—Black Wart and Ring Rot are overseas diseases that are most destructive of potato crops. There is also the Colorado Potato Beetle which is a damaging pest in North America and Europe. These are three good reasons why Plant Quarantine cannot allow potatoes to be imported from abroad.

Narcissus Fly—This is a very serious pest of bulbs and is present in most of the bulb-importing countries overseas. It attacks many popular bulbous plants including the daffodil.

Oriental Fruit Fly—This insect pest, one of the world's worst, entered the Hawaiian Islands during World War II. Joint action has been achieved by the Australian and New Zealand Governments with the United States Government to try to check its spread. The U.S. Department of Agriculture has made inspectors available at Honolulu for pre-flight examination and for treatment of all aircraft before taking off for Australia.

Japanese Giant Snail—This is another war legacy. It spread to parts of New Guinea, but so far has been kept out of continental Australia. Our alert quarantine officers have at times intercepted live specimens in ships' cargoes, and show patrons who saw the real shell on display could easily imagine what a feast the pest would have in an Australian home garden or market garden crop.

Sirex Wasp—Australia's developing pine forests are proving a valuable national asset, providing essential housing, furniture, case-making and plywood needs, as well as sustaining a large employment force. If the Sirex wood wasp got into these forests it could devastate them as it has done large areas in New Zealand. That is why Plant Quarantine checks all imports of softwood timber.

The story of these pests and diseases of plant life was told simply and strikingly in the recent Royal Show series.

So as to attract the greatest number of people possible and to teach the most in the least time, audio-visual aids were used effectively in combination with the bright and modern mounting devices.

Adapting the Continental exhibition technique of applying sound to a particular exhibit, "The Talking Tree" told the story of Citrus Canker in a way which was sure to give even the most disinterested passerby some inkling of Plant Quarantine activity. There is ample evidence, however, that many busy show patrons tarried—and at least heard the whole story.

Another popular feature was an Ampro Repeater Projector in which the campaign film "NOT WANTED ON VOYAGE" was screened, with sound, at frequent intervals. The screenings, which produced a vivid image, day or night, on the machine's self-contained television-like screen, never failed to gain an instant audience.

SUNRISE AND SUNSET TIMES FOR MARCH-APRIL, 1954

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

SUNRISE

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Mar.	1	5·49	6·3	6·16	6·19	6·4	6·13	6·5	5·43	5·52	5·56	6·5	5·58	6·1	5·59	6·4	6·8	5·57	6·2	5·47	5·40	6·7	5·54
"	5	5·51	6·5	6·18	6·22	6·8	6·16	6·9	5·47	5·56	6·0	6·9	6·2	6·5	6·3	6·8	6·10	6·1	6·6	5·51	5·44	6·11	5·58
"	10	5·52	6·6	6·19	6·23	6·10	6·18	6·12	5·50	5·59	6·3	6·12	6·5	6·8	6·6	6·11	6·13	6·4	6·9	5·54	5·47	6·14	6·2
"	15	5·54	6·9	6·22	6·27	6·14	6·22	6·16	5·54	6·3	6·7	6·16	6·9	6·12	6·10	6·15	6·17	6·9	6·14	5·59	5·52	6·19	6·7
"	20	5·55	6·10	6·24	6·29	6·16	6·25	6·19	5·57	6·6	6·10	6·20	6·13	6·16	6·13	6·18	6·20	6·12	6·17	6·2	5·55	6·22	6·10
"	25	5·56	6·11	6·25	6·30	6·18	6·27	6·21	5·59	6·8	6·12	6·23	6·16	6·19	6·17	6·22	6·24	6·16	6·21	6·6	5·59	6·26	6·14
"	31	5·57	6·12	6·27	6·32	6·21	6·31	6·25	6·3	6·12	6·16	6·27	6·20	6·23	6·21	6·26	6·28	6·21	6·26	6·11	6·4	6·31	6·19
April....	1	5·57	6·13	6·28	6·33	6·22	6·32	6·26	6·4	6·13	6·17	6·28	6·21	6·24	6·22	6·27	6·29	6·22	6·27	6·12	6·5	6·32	6·20
"	5	5·58	6·14	6·29	6·35	6·25	6·35	6·29	6·7	6·16	6·20	6·31	6·24	6·27	6·25	6·30	6·32	6·25	6·30	6·15	6·8	6·35	6·23
"	10	5·59	6·15	6·30	6·37	6·27	6·36	6·32	6·10	6·19	6·23	6·34	6·27	6·30	6·28	6·33	6·35	6·28	6·33	6·18	6·11	6·38	6·27
"	15	6·1	6·17	6·32	6·39	6·30	6·39	6·35	6·13	6·22	6·26	6·37	6·30	6·33	6·32	6·37	6·39	6·32	6·37	6·22	6·15	6·42	6·31
"	20	6·1	6·18	6·34	6·42	6·32	6·43	6·39	6·17	6·26	6·30	6·41	6·34	6·37	6·36	6·41	6·43	6·36	6·41	6·26	6·19	6·46	6·35
"	25	6·2	6·19	6·35	6·43	6·35	6·45	6·41	6·19	6·28	6·32	6·44	6·37	6·40	6·39	6·44	6·46	6·40	6·45	6·30	6·23	6·50	6·39
"	30	6·5	6·22	6·38	6·47	6·39	6·49	6·45	6·23	6·32	6·36	6·48	6·41	6·44	6·43	6·48	6·50	6·44	6·49	6·34	6·27	6·54	6·43

SUNSET

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Mar.	1	6·17	6·33	6·48	6·55	6·46	6·55	6·51	6·20	6·38	6·42	6·53	6·46	6·49	6·47	6·52	6·54	6·47	6·52	6·37	6·30	6·57	6·46
"	5	6·15	6·31	6·46	6·52	6·42	6·52	6·47	6·25	6·34	6·38	6·43	6·41	6·44	6·43	6·48	6·50	6·43	6·48	6·33	6·26	6·53	6·42
"	10	6·10	6·26	6·41	6·47	6·36	6·46	6·40	6·18	6·27	6·31	6·42	6·35	6·38	6·36	6·41	6·43	6·36	6·41	6·26	6·19	6·46	6·34
"	15	6·8	6·23	6·37	6·43	6·32	6·41	6·35	6·13	6·22	6·26	6·36	6·29	6·32	6·31	6·36	6·38	6·30	6·35	6·20	6·13	6·40	6·28
"	20	6·3	6·18	6·32	6·37	6·26	6·35	6·29	6·7	6·16	6·20	6·30	6·23	6·26	6·24	6·29	6·31	6·23	6·28	6·13	6·6	6·33	6·21
"	25	5·58	6·13	6·27	6·32	6·19	6·28	6·22	6·0	6·9	6·13	6·23	6·16	6·19	6·17	6·22	6·24	6·16	6·21	6·6	5·59	6·26	6·14
"	31	5·53	6·7	6·20	6·25	6·12	6·20	6·14	5·52	6·1	6·5	6·14	6·7	6·10	6·8	6·13	6·15	6·8	6·11	5·56	5·49	6·16	6·4
April....	1	5·52	6·6	6·19	6·24	6·11	6·19	6·13	5·51	6·0	6·4	6·13	6·6	6·9	6·7	6·12	6·14	6·5	6·10	5·55	5·48	6·15	6·3
"	5	5·49	6·3	6·16	6·20	6·6	6·14	6·7	5·45	5·54	5·58	6·8	6·1	6·4	6·1	6·6	6·8	6·0	6·5	5·50	5·43	6·10	5·57
"	10	5·46	6·0	6·13	6·16	6·1	6·10	6·2	5·40	5·49	5·53	6·3	5·56	5·59	5·56	6·1	6·3	5·55	6·0	5·45	5·38	6·5	5·52
"	15	5·42	5·56	6·8	6·11	5·57	6·5	5·57	5·35	5·44	5·48	5·57	5·50	5·53	5·51	5·56	5·58	5·49	5·54	5·39	5·32	5·59	5·46
"	20	5·39	5·52	6·4	6·7	5·52	6·0	5·52	5·30	5·39	5·43	5·52	5·45	5·48	5·44	5·49	5·51	5·42	5·47	5·32	5·25	5·52	5·39
"	25	5·35	5·48	6·0	6·2	5·46	5·54	5·46	5·24	5·33	5·37	5·46	5·39	5·42	5·38	5·43	5·45	5·36	5·41	5·26	5·19	5·46	5·33
"	30	5·33	5·46	5·57	5·59	5·43	5·50	5·42	5·20	5·29	5·33	5·41	5·34	5·37	5·34	5·39	5·41	5·31	5·36	5·21	5·14	5·41	5·28

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